Trans-Lake Washington Project

PRELIMINARY DRAFT

Preliminary Draft Lidding Options and Opportunities

Evaluation Report

Benefits and Costs of Lidding in the SR 520 Corridor

Prepared for

Washington State Department of Transportation
Office of Urban Mobility
401 Second Avenue South, Suite 300
Seattle, Washington 98104

Sound Transit
401 South Jackson Street
Seattle, Washington 98104

Prepared by

Trans-Lake Washington Project Team

Parametrix, Inc.
CH2M HILL
Parsons Brinckerhoff
EnviroIssues

PRELIMINARY DRAFT

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS

LIST OF APPENDICES

ACRONYMS

AACE	Association for the Advancement of Cost Engineering
CEQ	Council of Environmental Quality
CO	Carbon Monoxide
EIS	Environmental Impact Statement
HCT	High Capacity Transit
MSE	Mechanical Stabilized Earth
NEPA	National Environmental Policy Act
NO_x	Oxides of Nitrogen
SO_2	Sulfur Dioxide
TDM	Transportation Demand Management
VOC	Volatile Organic Compounds
WSDOT	Washington State Department of Transportation

1. EXECUTIVE SUMMARY

To be provided in final product, reflecting committee feedback.

2. STUDY CONTEXT AND APPROACH

2.1 PROJECT BACKGROUND AND DESCRIPTION

The Trans-Lake Washington project (Figure 2-1), originally sponsored by the Washington State Department of Transportation (WSDOT), convened a 47-member study panel in 1998. That panel took a no-holds barred look at the various ways to get across and around Lake Washington. The panel quickly recognized that there was no single answer, and turned to looking at solution sets with multiple modes of travel. As a result, the panel's consensus recommendations included actions to increase Trans-Lake mobility in several cross-lake corridors through potential roadway improvements, high-capacity transit (HCT) improvements, enhancements and mitigation elements, transportation demand management (TDM), and land use actions.

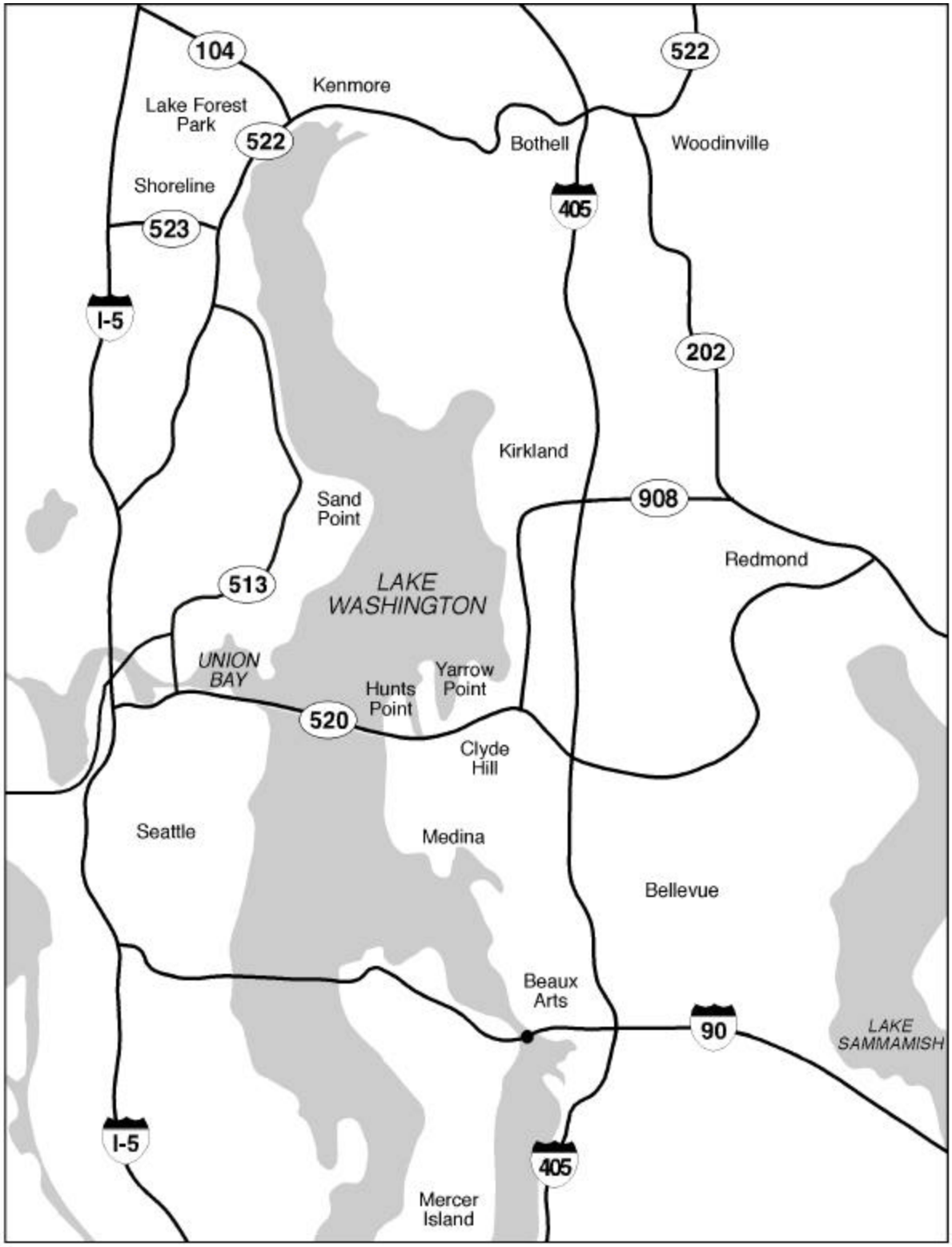
The goal of the Trans-Lake Washington project is to increase mobility across Lake Washington. Traffic across the lake, on both I-90 and SR 520, has increased dramatically in the last ten years. Even though improvements to the I-90 floating bridges in the 1990s helped increase mobility, the demand for moving people across the lake is still not being met. Increasing mobility requires more than concentrating on cars, buses and trucks. Increasing mobility means getting people to where they want to be as quickly as possible by using multiple modes of transportation—including cars, buses, bicycles, pedestrians, trucks and trains—and various other tools and incentives, such as TDM (e.g., free employee bus passes, telecommuting, and off-peak work hours).

Though the SR 520 corridor and the aging Evergreen Point Floating Bridge (SR 520 bridge) are major focus of the Trans-Lake Washington project, other routes across and around the lake are being looked at as part of this project. For the purpose of this report, the study area has been divided into four areas (Figure 2-2):

1. **Eastlake/Portage Bay/Roanoke/North Capitol Hill Neighborhoods**. The Eastlake neighborhood is generally described as the area from I-5 to the east, Roanoke Street to the north, Lake Union to the west, and Fairview Avenue to the south. The Portage Bay/Roanoke neighborhood is generally described as Portage Bay to the east, Lake Union to the north, I-5 to the west, and SR 520 to the south. The north Capitol Hill neighborhood is generally described as 15th Avenue to the east, SR 520 to the north, I-5 to the west, and Boston Street to the south.

2. **Montlake Neighborhoods**. The Montlake community is generally described as the residences and business districts to the north and south of SR 520, stretching from the Montlake Bridge at the north end to 24th and Boyer at the south end, and from the Arboretum and Husky Stadium to the east and to Portage Bay on the west.

3. **Lake Washington to West of I-405**. The communities west of I-405 to Lake Washington are generally described as the residences and business districts in the Towns of Hunts Point and Yarrow Point, and the cities of Medina and Clyde Hill. Additionally, portions of the cities of Kirkland and Bellevue are included in this area.



Trans-Lake Washington Project

PMX 234-1631-025/09(090400) (K), F1, 5/21/00

Figure 2-1
Study Area

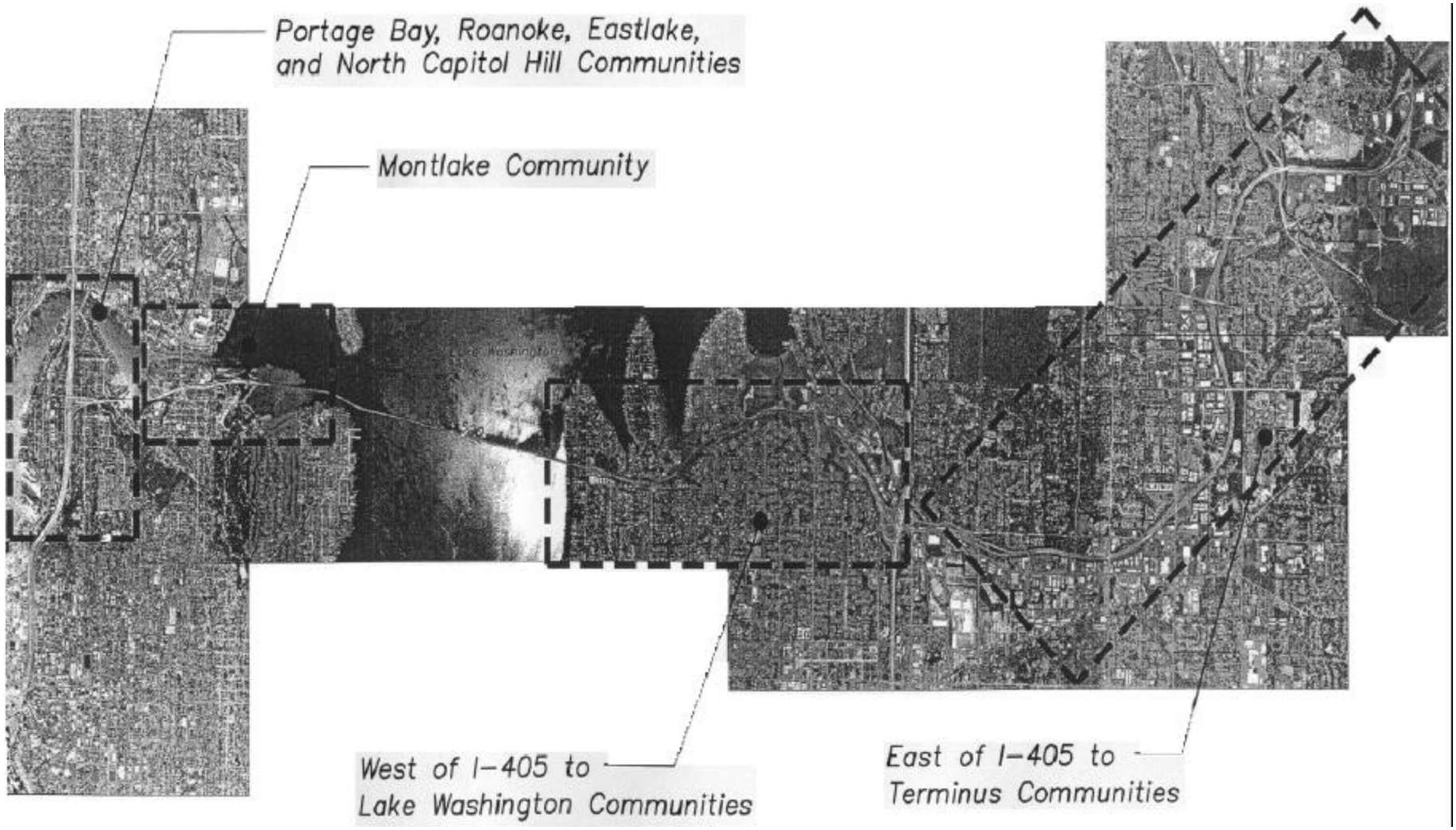


Figure 2-2.
Study Area Divided into Four Areas

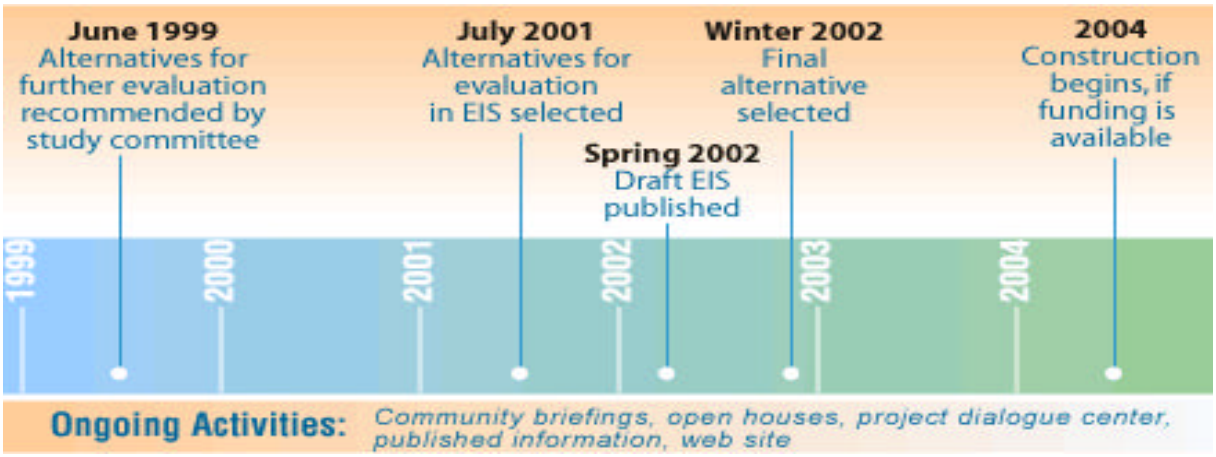
4. **East of I-405 to SR 202.** The communities east of I-405 to the terminus of SR 520 in Redmond are generally described as the residences and business districts in the cities of Bellevue and Redmond.

2.1.1 Project Status

WSDOT and Sound Transit have moved into the environmental review phase of the Trans-Lake Washington project. In this phase, the recommendations from the study committee, as well as alternatives suggested by other community members, agencies, and advocacy groups, will be evaluated to determine the recommendations' efficacy in improving mobility, their impacts on the environment and affected communities, and the steps that may need to be taken to lessen or eliminate (mitigate) negative impacts or to add positive impacts (enhancements). An environmental impact statement (EIS) will be prepared as part of the review process.

The environmental review process is expected to conclude in 2003. At that point, final design will begin, and phased implementation would begin in 2005 (Figure 2-3).

Figure 2-3: Project Timeline



2.2 APPROACH TO COMMUNITY-BASED DESIGN

A key objective of the project is to ensure that mobility improvements will be designed to make SR 520 a better neighbor with the community, and a better fit with the environment. In order to meet this objective, the community design process is a key part of the project, and allows communities to provide community input into the development and design of the potential alternatives. The objective of the community design process is to understand the answers to the following questions:

- What are the most important community objectives to factor into the design process?
- What is the community's vision of a successful project?

- What ideas will address the community's principles and values?
- What are promising ways to mitigate noise, traffic, and other transportation impacts?

Input received from participants in the process will be and have been incorporated, to the extent possible, to the design and evaluation. The project's technical team then provided the project's committees (Executive, Technical, and Advisory) workshop and open house feedback to be consider as part of their decision-making process. Community design workshops were held in four locations along the corridor:

- Portage Bay/Eastlake/Roanoke/North Capitol Hill neighborhoods
- Montlake and Laurelhurst neighborhoods
- West of I-405 to the eastern shore of Lake Washington
- East of I-405 to the terminus of SR 520

The purpose of the first community design workshops (November 2000), was to identify specific community values and characteristics relating to local traffic impacts, bicycle and pedestrian circulation, transit, community facilities, and community impacts. Some key issues identified by the communities included:

- Noise from the roadway is a significant impact to the neighborhoods today and this should be addressed in any of the proposed solutions.
- The ability to walk and ride bicycles around the neighborhood to parks, community facilities, and commercial areas is important. Safety should be addressed and walkways and trails enhanced.
- Other forms of pollution – air, stormwater runoff – should also be addressed by the project. This includes mitigating the impacts of today and tomorrow. Solutions should not worsen today's impacts.
- Access to transit, which is valued by many members of the community today and in the future, should be balanced with the possibility of drawing more regional users into the community.
- A successful solution will result in less noise, increased mobility, a bicycle/pedestrian route, a long-term solution, protection of neighborhoods, and more pleasant visual aesthetics.

A complete summary of the first community design workshop is included in the *Summary of November 2000 Community Design Workshops - Identification of Community Values* report. The second workshop (February 2001) was a presentation of potential alternatives and design options for review by the participants. Input from these workshops is included in the *Summary of February 2001 Community Design Workshops* report.

In order to ensure the input received during the community design workshops is reflective of the community at large, workshop invitees were selected to ensure broad community representation. This included residents, business, school and church representatives, park and public facilities representatives, etc. The project team worked with local jurisdictions along the corridor as well

as existing community groups to identify individuals and interests to participate in the process. Participants were asked to commit to participate in both workshops. An emphasis was placed on those who lived or worked immediately adjacent to the corridor; however, others were invited from major facilities, business, or neighborhoods that either had an impact on or were impacted by the SR 520 facility.

Open houses were held in the evening following the workshops to invite more general participation by the broader public in the community design process. At the evening sessions, the same questions and materials were presented to the public as were presented to the workshop participants. Invitations to the evening sessions were sent to the project's mailing list as well as posters placed at locations throughout the communities.

2.3 REPORT PURPOSE, LIDDING CONCEPTS AND EVALUATION

2.3.1 Report Purpose

Federal policy on mitigation, or reducing adverse impacts to the environment, is specified in the Council on Environmental Quality (CEQ) Regulations implementing the National Environmental Policy Act (NEPA) of 1969:

> "Federal agencies shall to the fullest extent possible: (f) Use all practicable means consistent with the requirements of the Act [NEPA] and other essential considerations of national policy, to restore and *enhance* the quality of the human environment and avoid or minimize any possible adverse effects of their actions on the quality of the human environment".

The purpose of this report is to evaluate community design enhancements related to placing lids throughout the study area, including a combination of noise walls and partial lids. Community enhancements could include incorporating park and recreation facilities, landscaping, pedestrian and bicycle paths, etc. into the lid, or partial lid, design. An example of this is the Interstate 90 (Appendix A) Completion Project in Seattle.

The community enhancements strategies in this report are based on qualitative measures. The community enhancement strategies will be further refined based on the project alternative(s) studied during the upcoming NEPA EIS process.

2.3.2 Evaluation Process

During the Community Based Design Process, a number of evaluative criteria were established to help participants examine a variety of project alternatives and design options. For the purposes of consistency, similar criteria have been established to assist in the evaluation of lidding options and opportunities, including: neighborhood connectivity; aesthetics; noise; air quality; and cost. These criteria are defined in Section 4 (Methodology and Criteria) of this report. In Section 5, the three lidding concepts identified within Section 3 are examined against each of the five aforementioned criteria, with a more detailed summary of the potential noise impacts provided for each concept.

A recommendation regarding lidding concepts will be prepared following the All Committee Workshop on May 23, 2001. At this point, it is anticipated the Executive Committee will be in a position to validate or modify the recommendations, allowing further, more detailed work to be conducted in the EIS phase of the project.

2.4 NOISE RELATED DESIGN ISSUES AND ANALYSIS METHODS

This section provides general information related to noise, highway design measures, and noise mitigation measures. For detailed information, the Trans-Lake Washington Team has produced a detailed report, *Noise Mitigation and Design Options*, April 2001. The report carefully details the noise analysis and mitigation process that will be used for the Trans-Lake Project.

The reduction of project related noise levels during the detailed design phase could be accomplished with noise reducing design measures. Noise reducing design measures include such items as traffic management and highway orientation. Traffic management measures include modifying speed limits, restricting or prohibiting truck traffic, or closing roadways or access ramps during times when noise could have an adverse effect.

Highway orientation design measures include altering the roadway alignment and depressing roadway cut sections. Alteration of roadway alignment could decrease noise effects by moving the noise source farther from the affected receivers. Because of the limited right-of-way in the project corridor, and the fact that noise impacts are expected to occur along both sides of the project roadway, this method is not seen as a feasible noise-reducing design option. In addition, realigning the Trans-Lake Washington Project would lower noise levels for residences on one side of the roadway, but would increase noise levels for residences on the other.

Other design options that could be used to reduce noise levels, such as adding noise walls depressing the corridor, or placing a lid over the roadway, are currently being considered in several sections of the project. This report will examine the benefits, and drawbacks, to providing lidded highway sections in select locations throughout the project corridor.

Once a highway design is completed, a detailed noise analysis is performed. The analysis uses the detailed design drawings, including any design measures, to determine traffic related noise impacts. For those locations where noise impacts are identified, noise mitigation is considered.

General information on highway design and noise mitigation measures that may be used on the Trans-Lake Project are given in the following sections. Information that is more detailed is available in the *Noise Mitigation and Design Options*, April 2001.

2.4.1 Depressed Highways

Depressed corridors are simply roadways placed below the elevation of the noise-sensitive receiver locations. This method can be very effective in reducing noise levels at structures located within a few hundred feet of the project corridor. The depressed corridor is often bordered by a retaining wall or berm. Depending on the type of vehicle traffic and the level of

corridor depression, a significant amount of noise can be blocked from reaching the noise-sensitive receiver locations.

2.4.2 Lidded Highways

Lidded highways are essentially depressed roadways that are covered to provide community connection. The lids effectively prevent sound from reaching noise-sensitive receiver locations adjacent to the lidded area. However, for receivers located near the end-points of the lidded roadway, noise levels can often be higher than would be produced with out the lid. The increased noise levels near end-points is caused by reflected noise resulting from the lid. For these locations, additional noise mitigation such as noise walls may be necessary near the portals.

If openings in the lids are used to ventilate the corridor, it should be noted that noise could also escape from these openings. Therefore, placing openings in locations as far as possible from noise-sensitive receivers can help to prevent additional noise impacts. For example, placing the opening near major arterial roads with access to the corridor is preferred because noise levels in this area are already elevated due to the traffic on the arterial road.

One primary concern with lidded corridors is proper ventilation of vehicle exhaust once lids become a certain size, (about 350 feet) ventilation is required. Lidded project corridors are essentially tunnels. Ventilation of the exhaust fumes is an important part of the design. Ventilation can be provided by leaving gaps or openings in the corridor lids to allow exhaust fumes to escape.

Ventilation fans can also be used to evacuate vehicle exhaust. It should be noted that the fans themselves make noise, and incorrect placement of the fans could result in noise impacts. It is possible to mitigate fan noise with noise-reducing louvers and silencers.

2.4.3 Noise Mitigation Measures

Mitigation measures normally evaluated for highway projects include noise walls and berms. Other mitigation measures such as property acquisition and sound insulation are evaluated on a case-by-case basis, and are normally reserved for projects involving high capacity transit, or when the proposed project generates extremely high noise levels.

Any specific mitigation measures that are recommended as part of the project must be considered feasible and reasonable by WSDOT and/or Sound Transit policies. Details on the feasibility and reasonableness of mitigation measures, along with design options and mitigation measures that may be applicable to the Trans-Lake Washington Project are given in the following sections.

2.5 DESIGN ASSUMPTIONS

- Lid sections that cover the freeway and are more than 350-feet in length will require mechanical ventilation and fire suppression systems.

- Lid widths are assumed to cover 8-lanes of highway traffic, and HCT lines. Interchange ramps will not be covered by lids.

- Roadway profile changes to accommodate lidded areas in Concepts 2 and 3 will not reduce the roadway design speed from what presently exists. For Concept 2, the roadway profile will be lowered up to 20 feet.

3. LIDDING CONCEPTS

The base premise for the different concepts is based upon logical sizing of the facilities resulting from: i.e., locations of existing overcrossings; areas in which the roadway traverses through "cut" sections (areas where hillsides were cut to facilitate smooth transections) and therefore topographically accommodating; and, those lidding concepts suggested in various community meetings where the lids would require significant changes to the roadway profile (or where the lid would create a box-line effect around the roadway). Each concept is described at specific location along the corridor in the following paragraphs.

3.1 EASTLAKE/PORTAGE BAY/ROANOKE/NORTH CAPITOL HILL NEIGHBORHOODS

3.1.1 Concept 1 - Expanded Bridges

This concept includes the use of wide bridges over SR 520 and I-5. There would be approximately 30 feet of widening beyond the traffic lanes to each side of the bridges carrying 10th Avenue East and Delmar Drive East over SR 520 and East Roanoke Street over I-5. The additional widening would provide space for enhanced non-motorized connections between neighborhoods. There would also be the opportunity for landscaping along the streets to improve the streetscape. A plan view of these structures is shown in Figure 3-1. Figures in Appendix A show similar expanded bridge treatment (Figure A-1 and A-2).

3.1.2 Concept 2 – Lids In Topographic Areas that Support Lidding

Concept 2 includes the placement of lids between the widened bridges described in Concept 1. The hilly terrain of these neighborhoods result in specific limits for lids that would not protrude above the surrounding ground level. Based on topography, the areas most appropriate to be considered for lid construction are I-5 at Roanoke Street and SR 520 from 10th Avenue to Delmar Drive. In addition, part of the westbound SR 520 roadway from I-5 to 10th Avenue could be covered. A plan view of this structure is shown in Figure 3-2. The lid subareas are described below:

I-5 Roanoke Street Vicinity

This area would cover approximately 400 feet of I-5, beginning 300 feet south of Roanoke Street and ending 100 feet north of Roanoke Street. The lid would be approximately 300 feet wide, resulting in 100,000 square feet of surface area excluding roadways. This lids topographic limits are the result of the elevation of the I-5 mainline. Lids over I-5 are shown where the I-5 mainline is sufficiently lower than Boylston Avenue and the lid structure will not protrude significantly higher than Boylston Avenue. This lid will likely protrude up to 10 feet above Boylston Avenue. There would be opportunities for enhanced non-motorized connections, landscaping, and passive or active open space on the lid. In order to allow the transportation of flammable materials on I-5, fire suppression and ventilation systems would be required. Exhaust fans and a ventilation shaft would be necessary in the vicinity of the lid. See Appendix A, Figures A-9 through A-11 for photos of ventilation shafts.

Westbound SR 520 - I-5 to 10th Avenue East

It is topographically feasible to cover the westbound lanes of SR 520 between I-5 and 10th Avenue E. This segment would be approximately 450 feet long and 100 to 250 feet wide, creating approximately 75,000 square feet (1.76 acres) of surface area. The area of this lid segment would be reduced if the ramp from westbound SR 520 to Harvard Avenue is retained. If provided, this lid would connect between the Roanoke and Delmar subarea lids. The flyover ramp from westbound SR 520 to southbound I-5 limits covering the eastbound lanes with a lid. This area would provide opportunities for enhanced non-motorized connections, landscaping, and passive or active open space. Mechanical ventilation may not be necessary for this segment. A fire suppression system would be required.

SR 520 - 10th Avenue East to Delmar Drive East

Approximately 600 feet of SR 520 would be covered, including the bridge crossings. The lid would be about 200 feet wide, resulting in a surface area of approximately 135,000 square feet (3 acres) excluding roadways. The eastern limit of this lid at Delmar is located approximately at the beginning of the SR 520 Portage Bay Bridge, where the surrounding terrain slopes steeply down toward Portage Bay. There would be opportunities for enhanced non-motorized and community connections, landscaping, and passive or active open space on the lid. In order to allow the transportation of flammable materials on SR 520, fire suppression and ventilation systems would be required. Exhaust fans and a ventilation shaft would be necessary in the vicinity of the lid.

3.1.3 Concept 3 - Community Suggestions

The community expressed the desire to extend the lid limits beyond those described in Concept 2 (Section 3.1.2) along I-5. These areas are described below and a plan view of this structure is shown in Figure 3-3.

I-5 East Roanoke Street to East Edgar Street

The I-5 lid would be extended north beyond Roanoke Street to approximately Edgar Street. The extension would be approximately 400 feet long, resulting in an additional lid area of 120,000 square feet (2.75 acres). There would be opportunities for additional landscaping and passive or active open space on the lid. This extension of the lid would protrude above the surrounding topography, especially on the west side of I-5 approaching Edgar Street. At Edgar Street the lid would be more than 20 feet above Boylston Avenue which would prevent reconnecting Edgar Street across I-5. Lowering of the I-5 roadway to keep the lid at the level of the surrounding neighborhood is not possible because of the Ship Canal Bridge to the north. The additional length of lid over I-5 would require a fire suppression system and mechanical ventilation. Siting of the vent shafts and mechanical equipment within the lid area would be necessary as well as additional structure width for ventilation ducts.

I-5 South of Roanoke Street

An extension to the south of the lid described in Concept 2 (Section 3.1.2) is possible but it would protrude more than 15 feet above Boylston Avenue to the west. This extension would be approximately 200 feet longer than the Concept 2 lid and would cover the southbound I-5 lanes between the westbound SR 520 to southbound I-5 ramp and Boylston Avenue. The area of the lid extension would be approximately 40,000 square feet (1 acre). The lid extension would provide opportunities for additional landscaping and passive or active open space. As with the above segment, fire suppression and mechanical ventilation systems would be required.

3.2 MONTLAKE NEIGHBORHOODS

3.2.1 Concept 1 - Expanded Bridges

This concept includes a wide bridge over SR 520 at Montlake Boulevard. There would be approximately 30 feet of widening beyond the traffic lanes to each side of the bridge. The additional widening would provide space for non-motorized uses to be separated from Montlake Blvd. There would also be the opportunity for landscaping along the streets to improve the streetscape. If the Park Drive undercrossing is reconstructed or a new Lake Washington Boulevard undercrossing is constructed, the new structures would also be constructed with additional widening. A plan view of this structure is shown in Figure 3-4.

3.2.2 Concept 2 – Lids In Topographic Areas that Support Lidding

The proximity of Portage Bay and Union Bay to the Montlake area results in a limited area that is topographically accommodating for a lid. In order to construct a lid that would not protrude above the surrounding ground level, the lid would be approximately 600 feet long, beginning 250 feet west of Montlake Boulevard and ending 350 feet east of Montlake Boulevard. The proximity of the lid to the Montlake Boulevard interchange results in ramps further reducing the potential lid area. Lowering of the mainline SR 520 is limited due to the lake elevations. However, depending on the Lake Washington Blvd interchange layout the lid area can vary significantly. The Pacific Street Extension tunnel will require raising the mainline so the interchange is above the lake elevation. If a tunnel is not used, the mainline can maintain the existing elevation and the lid could be longer. The resulting lid area with the tunnel option is approximately 100,000 square feet (2.25 acres) excluding roadway area. The lid area could provide enhanced transit facilities, landscaping, and passive open space. In order to allow the transportation of flammable materials on SR 520, fire suppression and ventilation systems would be required. Exhaust fans and a ventilation shaft would be necessary in the vicinity of the lid. A plan view of this structure is shown in Figure 3-5.

3.2.3 Concept 3 - Community Suggestions

The Montlake lid would extend eastward beyond the limit described in Concept 2 to approximately 1000 feet east of Montlake Boulevard. Because of surrounding topography, the portion of the lid beyond the Concept 2 limits would protrude up appearing as a “box” section.

Depending on the interchange concept chosen near Lake Washington Boulevard, this lid could protrude above the lake elevation between 40 to 70 feet. The topography to the east of Park Drive drops down significantly toward Lake Washington, thus causing the lid to protrude above ground level. The lid area excluding roadway surface would be approximately 360,000 square feet (8.25 acres). The lid area could provide enhanced transit facilities, landscaping, and passive open space. In order to allow the transportation of flammable materials on SR 520, fire suppression and ventilation systems would be required. Exhaust fans and a ventilation shaft would be necessary in the vicinity of the lid. A plan view of this structure is shown in Figure 3-6.

3.3 LAKE WASHINGTON TO WEST OF I-405

3.3.1 Concept 1 - Expanded Bridges

Evergreen Point Road Area

The bridge at Evergreen Point Road could be expanded to 100 feet in width to provide community amenities such as pedestrian and bicycle crossings of SR 520 as well as opportunities for landscaping and softening the look of the crossing. The widening could be accomplished without requiring significant changes to the SR 520 roadway grade and would blend into the roadside environment without protruding structures. A plan view of this structure is shown in Figure 3-7.

84th Avenue NE Area

A description of two lidding concepts has been provided for comparison and evaluation purposes.

Concept 1a: As with the Evergreen Point Road crossing, the bridge at 84th Avenue NE could be expanded to 100 feet in width to provide similar community amenities such as pedestrian and bicycle crossings. It would also provide opportunities for landscaping and softening the look of the crossing. The widening could be accomplished without requiring significant changes to the SR 520 roadway grade and would blend into the roadside environment without protruding structures. A plan view of this structure is shown in Figure 3-8.

Concept 1b: An alternate variation of the widened bridge concept at 84th Avenue NE would provide a 250 foot wide bridge structure across SR 520. It would provide the same connectivity enhancement described above but would also provide for a higher level of landscape enhancement. As with concept 1a, the SR 520 roadway grade would not have to be changed a great deal in order for the lid to blend in with the topography. Since the lid is less than 350 feet in length, it would probably not require mechanical ventilation. A plan view of this structure is shown in Figure 3-9.

92nd Avenue NE Area

A description of two lidding concepts has been provided for comparison and evaluation purposes.

Concept 1a: The bridge at 92nd Avenue NE could also be expanded to 100 feet in width to provide community amenities such as pedestrian and bicycle crossings of SR 520. Opportunities for landscaping and softening the view of the crossing could also be provided. The widening could be accomplished without requiring significant changes to the SR 520 roadway grade and would blend into the roadside environment without protruding structures. A plan view of this structure is shown in Figure 3-10.

Concept 1b: An alternate widened bridge concept at 92nd Avenue NE would provide a bridge approximately 300 feet in width to provide community amenities such as pedestrian and bicycle crossings of SR 520. With the increased width, further opportunities for landscaping and softening the view of the crossing could also be provided. This bridge structure would require lowering the roadway grade approximately 5 feet so that the structure would blend into the roadside environment without protruding structures. A plan view of this structure is shown in Figure 3-11.

3.3.2 Concept 2 – Lids In Topographic Areas that Support Lidding

Evergreen Point Road Area

In the vicinity of the Evergreen Point Road crossing, the maximum length of the lidded area that can be accommodated into the topography without lowering the roadway grade by excavation is approximately 100 feet (as noted in the Section 3.3.1). Additional lidded areas can be provided, but will require excavation of the roadway grade in order to fit into the topography. A description of two additional lid structures has been provided for evaluation purposes.

Concept 2a: This concept provides for a lid that is approximately 850 feet in length. This lid provides for the amenities described in Concept 1 (Section 3.3.1) and provides partial connectivity between Three Points School and Fairweather Park. A lid of this size can be accommodated into the topography by lowering the SR 520 roadway grade between 5 and 10 feet. There would be some protrusion of the lid portal areas (approximately 200 feet long and 15 feet high on both the east and west portals) and it is likely that the lid would require a mechanical ventilation and fire suppression facilities. A plan view of this structure is shown in Figure 3-12. Appendix A, Figures A-3 – A-5 show examples of protruding lid structures and how they can be treated to maximize function and minimize visual obtrusiveness.

Concept 2b: This concept extends the lid to approximately 1500 feet in length and provides good connectivity between the Three Points School area and Fairweather Park. A lid of this size can be accommodated into the topography by lowering the SR 520 roadway grade by 5 to 10 feet. Compared to Concept 2a, this concept would have quite a bit more protrusion of the lid portal areas (approximately 1000 feet long and 15-20 feet high on the east portal and 200 feet

long and 15 feet high on the west portal). It is likely that the lid would require a mechanical ventilation and fire suppression facilities. A plan view of this structure is shown in Figure 3-13.

84th Avenue NE Area

The 84th Avenue NE area can accommodate a lid of approximately 250 feet in length into the topography without significant changes to the SR 520 roadway grade. As the lid length is increased, the roadway grade would need to be lowered significantly above the surrounding terrain. Two concepts are provided for evaluation purposes to prevent the lid from protruding.

Concept 2a: This concept provides for a lid approximately 1300 feet in length as shown in Figure 3-14. Because 84th Avenue NE is in a roadway sag area, the extension of the lid without major changes to the roadway grade will result in a lid with a protruding box-like cross-section (approximately 700 feet long and 15-20 feet high on the east portal and 100 feet long and 10 feet high on the west portal). Because of this protruding section, this lid will not provide the desirable connectivity enhancements in the areas located away from 84th Avenue NE. Additionally, approximately two-thirds of the lid will need to be "stair-stepped" and will not result in flat, open space that could be used for active recreational activities. Since this lid is greater than 350 feet, it will likely require mechanical ventilation and fire suppression facilities. Appendix A, Figure A-7 includes an example of a stair-stepped lid section.

Concept 2b: This concept provides for a lid approximately 1800 feet in length as shown in Figure 3-15. A more aggressive lowering of the SR 520 grade was used for this concept (in contrast to Concept 2a) to test the accommodation of the lid into the topography of the area. For the concept the roadway grade was lowered approximately 10 feet. While the plan view of this alternative would indicate good community connectivity, the profile still results in at least half of the lid appearing as a protruding box structure (approximately 1000 feet long and 15-20 feet high on the east portal and 100 feet long and 10 feet high on the west portal). As with Concept 2a, the lid would need to be stair-stepped and will not result in flat open space that could be used for active recreational activities. Since this lid is greater than 350 feet, it will likely require mechanical ventilation and fire suppression facilities.

92nd Avenue NE Area

The 92nd Avenue NE area is in a crest vertical curve area that lends itself to a significant lidding provided the SR 520 roadway profile is lowered. Without excavation of the roadway grade, the length of lid that can be accommodated into the topography is roughly 100 feet. Two concepts are provided for consideration.

Concept 2a: This concept provides for a lid of approximately 1200 feet in length. If the profile of SR 520 is lowered by approximately 10 feet, the lid will provide good community connectivity without the type of lid protrusion that is problematic in the 84th Avenue NE area (the lid protrusion would be approximately 200 feet long and less than 10 feet high on the east portal and 100 feet long and 10 feet high on the west portal). The east-bound on ramp and west-bound off ramp will require openings in the lid. If the SR 520 grade is not lowered, this length of lid would have significant portions protruding above the surrounding topography. A lid of

this length would require mechanical ventilation and fire suppression facilities. A plan view of this structure is shown in Figure 3-16.

Concept 2b: This concept provides for a lid of approximately 2400 feet in length. If the profile of SR 520 is lowered by approximately 10 feet, the lid will provide good community connectivity and minimal lid protrusion (the lid protrusion would be approximately 200 feet long and less than 10 feet high on the east portal and 250 feet long and 10-20 feet high on the west portal). This lid would require openings for the east-bound on ramp and west-bound off ramp. If the SR 520 grade is not lowered, this length of lid would have significant portions protruding above the surrounding topography. A lid of this length would require mechanical ventilation and fire suppression facilities. A plan view of this structure is shown in Figure 3-17.

3.3.3 Concept 3 - Community Suggestions

Continuous Lid Structure from Lake Washington to Bellevue Way NE:

The community has identified that a lid spanning the distance from Lake Washington to Bellevue Way would be desirable. A preliminary conceptual layout for a lid of this magnitude is shown in Figure 3-18. This lid is approximately 9800 [TH1]feet long and extends from west of Evergreen Point Road to west of Bellevue Way NE. This concept requires lowering the SR 520 grade approximately 20 feet in several locations in an attempt to minimize lid protrusion. Even with this amount of excavation, this lid would have significant portions of the structural elements protruding above the surrounding neighborhood grade as noted below in Table 3-1:

Table 3-1. Protruding Lid Sections for Continuous Lid Structure from Lake Washington to Bellevue Way

Lid Area	Length (feet)	Height (feet)
Evergreen Point Road to 84th Avenue NE	1400	10-20
84th Avenue to 92nd Avenue NE	1600	20-40
92nd Avenue NE to Bellevue Way NE	2400	20-30

Even though the ventilation requirements have not been analyzed, it is assumed that this size of lid would require two major ventilation and fire suppression structures.

It may be possible to further lower the roadway grade to accommodate more of the lidded structure, with deeper excavation or tunneling. However, interchange connections would be difficult to make.

3.4 EAST OF I-405 TO SR 202

3.4.1 Concept 1 - Expanded Bridges

No expanded bridges have been proposed in this area.

3.4.2 Concept 2 – Lids In Topographic Areas that Support Lidding

No areas have been identified that support lids that fit in with the topography.

3.4.3 Concept 3 - Community Suggestions

During the community design workshops, possible lids were suggested in the vicinity of NE 40th Street and NE 31st Street, the surfaces of which could be used for urban uses, such as parking garages or other commercial activities. The approximate size of these lids would be 800 feet and 400 feet for each respective street. Construction of lids at these locations would require minimal excavation. Lids that are this size would likely require mechanical ventilation.

Figure 3-1

Figure 3-2

Figure 3-3

Figure 3-4

Figure 3-5

Figure 3-6

Figure 3-7

Figure 3-8

Figure 3-9

Figure 3-10

Figure 3-11

Figure 3-12

Figure 3-13

Figure 3-14

Figure 3-15

Figure 3-16

Figure 3-17

Figure 3-18

4. METHODOLOGY AND CRITERIA

4.1 METHODOLOGY

This section describes the methodology and criteria used for the qualitative evaluation of community enhancement strategy concepts.

4.2 CRITERIA

4.2.1 Neighborhood Connectivity

This criterion qualitatively examines the effectiveness of the community enhancement concepts in strengthening neighborhood connectivity. Community enhancement concepts can affect neighborhood connectivity through their physical presence (either as a barrier or a "bridge") as well as through incorporated design amenities (such as themed landscaping or pedestrian path links). Specifically, neighborhood connectivity will be evaluated in three general elements including the preservation or reestablishment of the physical neighborhood structure, the preservation or reestablishment of travel routes (pedestrian/bike and vehicular), and the inclusion of amenities or opportunities for new public facilities. Effects on the physical neighborhood structure refers to the ability of a concept to serve as a connecting mechanism as opposed to a physical barrier. Effects on pedestrian and vehicular travel routes involves preserving intra-neighborhood traffic routes or establishing new routes that serve local movements. Enhancement concepts that provide additional neighborhood amenities, such as landscaping, would have a positive impact neighborhood connectivity. Finally, community enhancement concepts that present the opportunity for new public facilities, such as open space or civic buildings, can further enhance a neighborhood's identity. These three elements are not necessarily mutually exclusive, but instead collectively represent the notion of a cohesive neighborhood.

4.2.2 Aesthetics

This criterion qualitatively examines how to maintain or enhance the existing visual and aesthetic environment (e.g., scenic views, open space, vegetation, and overall character) in each of the community enhancement concepts.

4.2.3 Noise

This criterion qualitatively examines how the three community design concepts reduce the potential noise impacts from the project for selected neighborhoods and other known sensitive receptors. The criterion contains three general considerations:

1. Noise reduction benefits
2. Supplemental noise mitigation
3. Overall noise reduction and residual impacts

The noise reduction benefits relates to the reduction in noise impacts and reduction in overall noise levels related to the design Concept. Noise mitigation is the mitigation measures such as noise walls or berms that may be required to reduce residual noise impacts near the portals that are not eliminated by the lidding concept. Finally, the overall noise reduction and residual impacts is a general comparison between the number of expected impacts, level of supplemental mitigation and overall future noise levels. A summary table containing comparisons of the lidding concepts, supplemental mitigation and overall noise levels is given in Chapter 5.

4.2.4 Air Quality

This criterion qualitatively examines potential air quality impacts and how to maintain or enhance air quality in each of the community enhancement concepts. It includes a description of any potential improvements, or reduction, in impacts afforded by the proposed concepts. Also included is a brief discussion on method(s) to mitigate any air quality impacts from the project, given the changes afforded by lidding.

4.2.5 Cost

The methodology used to assemble the community enhancement capital cost opinions is similar to that used in the modal effort with some modifications. The methodology used in the modal effort is described in the *Draft Highway Capital Cost Methodology Report* published on February 20, 2001. A summary of these assumptions is provided below. For more details on the general assumptions used, description of how unit costs were determined, and definitions of allowances, contingency and sales tax refer to this report.

4.2.5.1 Assumptions

In assembling cost opinions for the Community Enhancement Strategies, several assumptions were made:

- Lids that are greater than 350-feet in length will require ventilation and fire suppression equipment.
- Landscaping on top of lids will only include soil and seeded grass.
- There are no buildings or structures placed on top of the lids.
- Lid construction will be staged so that there are two lanes of traffic flowing in each direction at all times, with the exception of certain limited late night closures. Due to the high volumes of traffic that travel down the SR 520 corridor, this construction staging will be extensive.
- The estimate assumes that the highway construction will take into account the placement of selected lid structures. If the highway is built without consideration for lid placement then the cost of the lid structures will increase due to having to readjust drainage, additional pavement demolition and extra profile adjustments.

4.2.5.2 Construction Units

This cost opinion uses the same units as in the previous estimating efforts. Many of these costs units come from previous efforts and were examined using current WSDOT Bid Tabs, actual historical cost data, R.S. Means Estimating Manuals, consultation with structural engineering experts, and WSDOT Bridges and Structures. Costs have been escalated to 2001 dollars when provided from a previous effort. Table 4-1 shows the units of measurement that were used in this cost opinion. While the cost of each lidding concept is summarized in the text accompanying the evaluation of each concept (Section 5 of this report), a comparative chart portraying the rough cost of each concept is provided within Appendix B.

Table 4-1: Units of Measure

Type	Unit	Details
Lids without Ventilation	Square feet of lid decking	This includes excavation for the foundation, concrete for foundation, walls and decking, rebar, girders, waterproofing the deck slab, barriers, illumination. The lid cost also includes basic landscaping costs such as soil, drainage, irrigation, and planting costs. This unit was developed in consultation with the project structural engineer.
Lids with Ventilation	Square feet of lid decking	This includes excavation for the foundation, concrete, rebar, girders, decking, waterproofing the deck slab, barriers, and illumination. It also includes ventilation ducts, systems, and structures plus fire protection. The lid cost also includes basic landscaping costs such as soil, drainage, irrigation, and planting costs. This unit was developed in consultation with the project structural engineer.
Cut and Fill	Cubic Yards	This is additional excavation and backfill cost to change the profile of the roadway and side sloping. It also includes any related costs such as compaction, excavation shoring and slope safety. This cost was established from R.S. Means data and bid tabs.
Expanded Bridge Deck with Landscaping	Square Feet of Bridge Decking	This cost includes bridge decking, supports, barriers, illumination and foundation work. This cost also includes basic landscaping costs such as soil, drainage, irrigation and planting cost. This unit was developed by using the Arterial Bridge Unit and adding additional landscaping costs.
Retaining Walls	Square Feet	Retaining walls are assumed to be a mixture of mechanically stabilized earth (MSE) and soldier pile wall both with tiebacks into the hillside. This cost also includes intermediate slope and safety control. This cost was developed in consultation with WSDOT Bridge and Structures.
Noise Walls	Linear Feet	Noise walls are assumed to be 8-16 feet high and 6-10 inches thick with a continuous foundation. For costing noise walls are assumed to be 12 feet high and 8 inches thick. These costs include excavation and backfill for the wall foundation. The cost used in the previous study and brought to current dollars as described above.

4.2.5.3 Limitations

The expected accuracy range of this cost estimate is -30 percent to +50 percent or greater based on information available at the planning level. This planning-level cost opinion is intended only for the purpose of economic comparison of the different community enhancement alternatives based on information available at the time of preparation. Because of the preliminary nature of this cost opinion, final project costs will vary from those shown and will depend on actual costs for labor, construction equipment, disposal, and materials as well as surface and subsurface conditions, regulatory constraints, approach to corridor mitigation, labor productivity, competitive market conditions, final project scope, schedule, and other factors. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets. This is a Class 5 cost opinion as defined by the Association for the Advancement of Cost Engineering (AACE).

5. EVALUATION

5.1 BACKGROUND

The NEPA process is intended to help public officials make decisions based on a full understanding of the environmental consequences of the proposed project. The disclosure of environmental consequences informs decisions and actions that protect, restore, and enhance the environment (40 CFR 1500.1(b)). In its Findings and Recommendations, the Trans-Lake Washington Study Committee stated:

> Mitigation and *enhancement* must be integral to and inseparable from the proposed transportation improvements. Mitigation and enhancement should start with sensitive project design where potential impacts are minimized wherever possible. Project design and mitigation elements should potentially include lids, multiple-level structures, grade separation, tunnels and other significant treatments such as those which have been and will be suggested by the affected communities. Mitigation of impacts caused by existing transportation facilities must be considered along with new impacts. The magnitude of mitigation measures must be commensurate with the amount of impact caused by the action….The transportation alternatives developed should be designed to avoid or minimize identified impacts…. Transportation alternatives should enhance local communities by taking advantage of opportunities to:

- Implement objectives of local and regional plans
- Improve transportation safety and reliability
- Improve access and mobility for pedestrians and bicyclists
- Connect neighborhoods separated by transportation facilities
- Improve the visual appearance of transportation facilities
- Provide space for community-desired uses
- Enhance and preserve sensitive areas, parks, and historic sites
- Maintain a strong base of employment and enhance economic opportunities for individuals and communities
- Produce commute options that assure dependable and acceptable commute times

5.2 EVALUATION OF LIDDING CONCEPTS

The following sections evaluate the three categories of lidding concepts identified within each of the four neighborhood areas against the five criteria listed in Section 3:

- Neighborhood Connectivity
- Aesthetics
- Noise

- Air Quality
- Cost.

5.2.1 Eastlake/Portage Bay/Roanoke/North Capitol Hill Neighborhoods

5.2.1.1 Concept 1 - Expanded Bridges

Neighborhood Connectivity

This concept would result in limited improvements to neighborhood connectivity. Each of the expanded bridges would provide areas suitable for additional landscaping as well as improved non-motorized connections such as bicycle and pedestrian paths. Although no new paths would be created, the pedestrian environment and setting could be improved with landscaping which could encourage non-motorized travel between these neighborhoods. Landscaping on each of the bridges could be thematically tied to Roanoke Park, which could visually connect the neighborhoods. Vehicular travel routes would be neither enhanced nor detrimentally altered. Widened bridges in these neighborhoods would not have the capacity for the provision of neighborhood amenities or civic facilities.

Aesthetics

The width of bridges in this concept could allow for "streetscaping" (plantings, attractive pavement, site furniture, etc.) that could be designed to match the character of the Roanoke and Eastlake neighborhoods. The addition of non-motorized transportation lanes would provide a buffer between pedestrians and vehicular traffic.

Noise

Under the expanded bridge option, noise impacts are projected to remain near, or equal to, the number projected without the added structures.

Noise mitigation measures considered under this option would include noise walls and combined noise walls on retaining walls. On the south side of SR 520, near I-5, the noise wall may be in combination with a retaining wall along the I-5 northbound to SR 520 eastbound connector ramp. Noise walls along the north side of SR 520 may be placed between the expanded bridges from I-5 to the Portage Bay structure.

It is also possible that noise walls could be placed along the west side of I-5 Between E Lynn St and E Edgar St (or E Hamlin St), and along the east side of I-5 from SR-520 to E Hamlin. The actual length and height of the wall would be determined during the Project noise analysis. Additional noise mitigation measures for the east side of I-5, south of the SR-520 interchange, and north of E Hamlin St, may also be performed as part of the Trans-Lake Washington Project.

Air Quality

This concept would have no impact on the quantity of gaseous air emissions released from vehicle exhaust, including carbon monoxide (CO), oxides of nitrogen (NO_x), volatile organic

compounds (VOC) and sulfur dioxide (SO_2).

Cost

The cost associated with Concept 1 is roughly estimated at $60 million (M). Tables detailing the cost assumptions can be found in Appendix B.

5.2.1.2 Concept 2 – Lids In Topographic Areas that Support Lidding

Neighborhood Connectivity

The incorporation of a lid over I-5 near Roanoke Street would physically reconnect the Eastlake and Portage Bay/Roanoke neighborhoods. The lid would not alter vehicular routes but would have the potential to enhance a bike/pedestrian connection along Roanoke Street. The space provided by the lid would allow for additional design treatments and landscaping on Roanoke Street that could connect it with Roanoke Park. This could allow for a pedestrian open space link because there would be sufficient area on the lid for the creation of passive open space. Larger civic facilities could also be placed on this lid. The presence of a ventilation shaft could be physically intrusive depending on its location.

Placing a lid over SR 520 between 10th Avenue E and Del Mar Drive E would physically reconnect the Portage Bay/Roanoke and North Capitol Hill neighborhoods. The lid would not alter vehicular routes but would have the potential to enhance a bike and pedestrian environments across SR 520 with landscaping and pedestrian amenities. Open space created on top of this lid could be connected with Roanoke Park to the north. A lid of this size would have the capacity to provide space for larger neighborhood amenities or civic facilities. The presence of a ventilation shaft could be physically intrusive depending on its location.

Locating a lid over the westbound SR 520 lanes near Roanoke Street would not completely reconnect the Portage Bay/Roanoke and North Capitol Hill neighborhoods because the eastbound lanes on SR 520 would remain exposed. The lid would not alter vehicular routes and would not provide additional pedestrian/bicycle enhancement opportunities beyond those afforded by a widened bridge. This lid could allow for a pedestrian open space link to Roanoke Park because there would be sufficient area on the lid for the creation of passive open space. The presence of a ventilation shaft could be physically intrusive depending on its location.

Aesthetics

Lids in Concept 2 would be beneficial in several ways: They could partially block views of SR 520 and Interstate 5; they would tie together the visual character of neighborhoods on opposite sides of the freeways; and they could provide attractive open space with plantings, community gathering places, and public amenities. In some locations, it would be possible to provide spots from which scenic views could be enjoyed. Additionally these lids could be designed to act as formal gateways from one neighborhood or area to another, creating a distinct visual character and a sense of place, and helping travelers passing both over and under the lids to get their bearings.

Noise

Under the Concept 2 Option, the lidded areas of SR-520 would be increased to provide coverage of portions of I-5 and additional portions of SR-520. The additional lids may be effective at reducing the number of potential noise impacts for receivers east of I-5 and north of SR 520.

Noise mitigation measures that may be considered under this option would include the combined retaining – noise wall along the northbound I-5 to eastbound SR 520 access ramps and potential noise walls along the south side of SR 520 west of 10th Avenue. Addition noise walls may also be considered for both sides of I-5 north of the lid to E Hamlin. Also, additional noise mitigation for the east side of I-5 may also be performed as part of the Trans-Lake Washington Project. In addition, the ventilation fans may also require mitigation in the form of noise reducing louvers or fan silencers.

With the proposed mitigation measures, the overall number and magnitude of residual noise impacts is not expected to change substantially when compared to Concept 1.

Air Quality

Each of the lid options under Concept 2 would have no impact on the quantity of gaseous air emissions released from vehicle exhaust, including carbon monoxide (CO), oxides of nitrogen (NO_x), volatile organic compounds (VOC) and sulfur dioxide (SO_2). There would be a change in the manner to which the gaseous pollutants are delivered to the airshed, as those emissions occurring within the lidded portion at the I-5/SR 520 interchange would migrate out either end of the lidded structure. This could result in higher localized concentrations near the lidded openings and lower concentrations at points over the lidded structure except in the vicinity of the vents described below, although this is highly dependent on both traffic and meteorological conditions at any given time. No quantitative estimate for the impact to concentrations can be made at this time.

In addition, lids in the I-5 Roanoke Street vicinity and 10th Avenue E/Delmar Drive E vicinity would require ventilation systems. Gaseous pollutants would be collected and released from vents located somewhere on top of the lids. Although the total emissions will be unchanged, this will result in a change to the method of delivery to the atmosphere. While this may result in reduced concentrations of pollutants in some areas in the vicinity of the lid, it is possible that some areas near the ventilation point may experience elevated concentrations resulting from a more concentrated exhaust stream. Determination of the effects is highly dependent on design of the ventilation system and location, as well as traffic and meteorological conditions. Design of the ventilation system will be performed to optimize dispersion and minimize impacts to those in the vicinity of the ventilation point. The technical feasibility of venting the exhaust through a control device to reduce pollutant emissions would also be explored.

For particulate emissions, there may be a slightly higher likelihood of reduced impacts to areas directly next to the lidded structure as re-entrained particles will face a great obstacle to entering adjacent neighborhoods. As with gaseous pollutants, smaller particles will be dispersed out either end of the lidded area, but larger particles will settle out.

Cost

The cost associated with Concept 2 is roughly estimated at $360 million (M). Tables detailing the cost assumptions can be found in Appendix B.

5.2.1.3 Concept 3 - Community Suggestions

Neighborhood Connectivity

Extending a lid over I-5 to Edgar Street would provide additional space for neighborhood amenities, but would have a limited effect on connectivity between Eastlake and Portage Bay/Roanoke because of topographic differences. New bicycle and vehicular connections may not be practical because the lid would protrude 15 feet above Bolyston Avenue. Also, the presence of this lid could create a visual barrier that could further disconnect the Eastlake and Portage Bay/Roanoke neighborhoods. Still, this lid would be large enough for active or passive open space as well as larger civic amenities. Additional open space connections could be made within the Portage Bay/Roanoke neighborhood. The presence of a ventilation shaft could be physically intrusive depending on its location.

The extension of the lid south of Roanoke Street would have a limited effect on neighborhood connectivity. The main benefit of the extension would be in the extra space provided for active or passive open space. Similar to the northern extension, the southern extension would protrude above Boylston Street, complicating pedestrian connections and eliminating feasible bicycle and vehicular connections. The presence of this lid could create a visual barrier that could further disconnect the Eastlake and North Capitol Hill neighborhoods. The presence of a ventilation shaft could be physically intrusive depending on its location.

Aesthetics

The extended lids in this concept would have benefits similar to those in Concept 2. However, extension of lids in this concept would require walls that would rise to the third floor level of adjacent residences. These walls would cast shadows, block local views, and contrast with the scale and character the neighborhood.

Noise

Under the Concept 3 option, the lidded areas of SR 520 would be increased again to provide additional coverage of portions of I-5 and additional portions of SR 520. The additional lids may be effective at reducing the number of potential noise impacts for receivers east of I-5 and north of SR 520 when compared to Options 1 and 2. As described under Option 2, there is the potential for increased noise levels at receiver locations along the south side of SR-520 and ventilation fan mitigation may also be required.

Noise mitigation that would be considered under this concept include the noise wall/retaining wall combo along the I-5 to SR 520 eastbound connector ramps along with noise walls along the south side of SR 520 from 10th Avenue E. to the Portage Bay Structure.

With the proposed mitigation measures, the overall number and magnitude of residual noise impacts is not expected to change substantially when compared to Concept 1 or 2. However, noise levels at receivers located within the lidded areas of the highway would experience lower noise levels than under Concept 1 or 2 with the noise mitigation.

Air Quality

Similar to Concept 2, this concept would have no impact on the quantity of gaseous air emissions released from vehicle exhaust, including carbon monoxide (CO), oxides of nitrogen (NO_x), volatile organic compounds (VOC) and sulfur dioxide (SO_2). There would be a change in the manner to which the gaseous pollutants are delivered to the airshed, as those emissions occurring within the lidded portion at the I-5/SR 520 interchange would migrate out either end of the structure. This could result in higher localized concentrations near the lidded openings and lower concentrations at points over the lidded structure except in the vicinity of the vents described below, although this is highly dependent on both traffic and meteorological conditions at any given time. No quantitative estimate for the impact to concentrations can be made at this time.

In addition, both lids would require ventilation systems. Gaseous pollutants would be collected and released from vents located somewhere on top of the lids. Although the total emissions will be unchanged, this will result in a change to the method of delivery to the atmosphere. While this may result in reduced concentrations of pollutants in some areas in the vicinity of the lid, it is possible that some areas near the ventilation point may experience elevated concentrations resulting from a more concentrated exhaust stream. Determination of the effects is highly dependent on design of the ventilation system and location, as well as traffic and meteorological conditions. Design of the ventilation system will be performed to optimize dispersion and minimize impacts to those in the vicinity of the ventilation point. The technical feasibility of venting the exhaust through a control device to reduce pollutant emissions would also be explored.

For particulate emissions, there may be a slightly higher likelihood of reduced impacts to areas directly next to the lidded structure as re-entrained particles will face a great obstacle entering adjacent neighborhoods. As with gaseous pollutants, smaller particles will be dispersed out either end of the lidded area, but larger particles will settle out. Likewise, re-entrained particles will be released from the ventilation point.

Cost

The cost associated with Concept 3 is roughly estimated at $500 million (M). Tables detailing the cost assumptions can be found in Appendix B.

5.2.2 Montlake Neighborhoods

5.2.2.1 Concept 1 - Expanded Bridges

Neighborhood Connectivity

A wider bridge in this neighborhood could improve non-motorized movement across SR 520 but

would not serve as a strong physical connection. The additional bridge space would allow the implementation of features such as street trees, a planted median, and other aesthetic amenities close to the roadway. The Montlake transit stop could also be upgraded to include design elements. Vehicular travel patterns would be unaffected. Depending upon the interchange chosen, the bridge area would remain as the sole connector between the north and south portions of the Montlake neighborhood. Larger civic amenities could not be included on a widened bridge.

Aesthetics

The expanded bridge in this concept (along with its approaches) could be designed to match the character and feel of the Montlake neighborhoods. This concept would entail utilization of extensive noise barriers. Some of these would be located in cut profiles of the SR 520, where they would be below the sight line of adjacent land uses. In several cases, these barriers would be located at grade adjacent to residential neighborhoods. They would reduce noise levels, and may screen undesirable highway views. However they may also block scenic views, cast shadows, and contrast with the surrounding visual character. Visual impacts from barriers may be reduced by carefully designing them to match the scale and feel of the neighborhoods in which they are placed. Plantings along barriers would help them blend into their surroundings, and use of appropriate materials would allow barriers to match the architectural styles of nearby buildings.

Noise

Expanded bridges are not projected to result in a significant reduction in the number of noise impacts when compared to a standard bridge.

Noise mitigation in the form of noise walls would most likely be proposed for both sides of SR 520 through the residential neighborhoods . The proposed walls would be placed close to, or in, the SR 520 right-of-way and have estimated heights of 10 to 14 feet. For some areas, where the residents are located above grade, optimal wall placement may be closer to the receivers along the hillside. Actual wall placement and wall height would be determined during the environmental noise analysis. In addition, noise mitigation on the SR 520 connecting ramps may also be considered.

Air Quality

This concept would have no impact on the quantity of gaseous air emissions released from vehicle exhaust, including carbon monoxide (CO), oxides of nitrogen (NO_x), volatile organic compounds (VOC) and sulfur dioxide (SO_2).

Cost

The cost associated with Concept 1 is roughly estimated at $25 million (M). Tables detailing the cost assumptions can be found in Appendix B.

5.2.2.2 Concept 2 – Lids In Topographic Areas that Support Lidding

Neighborhood Connectivity

The addition of a lid in this neighborhood could reestablish a small part of its visual connection. Covering the SR 520/Montlake Boulevard interchange, the lid would establish a physical link over the highway that could feature an enhanced Montlake Boulevard (in a manner similar to Lake Washington Boulevard) with street trees, a planted median, bike/pedestrian trails and other aesthetic amenities. The Montlake transit stop could also be upgraded to include design elements. The presence of off- and on-ramps at this interchange could preclude connections, depending upon the interchange. New active or passive open space along Montlake Blvd could still strengthen the visual connection of the neighborhood, however. The presence of a ventilation shaft could be physically intrusive depending on its location.

Aesthetics

The lid in Concept 2 would block views of SR 520, especially where viewers are most numerous. The lid would provide a platform for a landscape that would tie together the visual character of the Montlake neighborhoods, providing attractive open space with plantings, community gathering places, and public amenities. Additionally the lid could be designed to act as a transitional gateway between the south Montlake area and the University, strengthening the sense of place in both of these areas.

Because the lids in this concept would be located in areas where the existing topography would accommodate them, it would not be necessary to build tall walls at the lids' peripheries that would block views from adjacent neighborhoods, and contrast with the overall character and scale of surrounding visual resources. Additionally, the lidded freeway would require a substantial vent structure. This would rise well above the lid surface, obstructing views and contrasting with existing and proposed visual resources.

Noise

Under Concept 2 the lidded portions of SR 520 would be extended to approximately 350 feet past the existing structure. The combine lid and depressed highway would reduce the number of noise impacts at residents located near the Montlake Boulevard overpass. However, noise levels would increase for residents located to the east or west of the proposed lid due to reflected noise.

Noise mitigation that may be required to reduce or the eliminate noise impacts would include noise walls along both sides of SR 520, from the lid endpoints to the ends of the residential areas. Any noise impacts from ventilation fans would be mitigated with noise reducing louvers or fan silencers.

The lid and the additional noise mitigation measures would result in future noise levels and residual impacts that would be similar to those under Concept 1.

Air Quality

Impacts would be similar to those described for Concept 2 in the Eastlake/Portage Bay area.

Cost

The cost associated with Concept 2 is roughly estimated at $110 million (M). Tables detailing the cost assumptions can be found in Appendix B.

5.2.2.3 Concept 3 - Community Suggestions

Neighborhood Connectivity

The lid in Concept 3 in the Montlake neighborhood would offer more space for the same type of potential benefits as those described for the neighborhood in Concept 2. The lid area could provide enhanced transit facilities, landscaping, and passive open space. However, the lid would be extended to areas where SR 520 could not be lowered, which would result in the lid protruding above the existing grade by 20 – 25 ft (or as high as 60 ft) , depending upon the interchange design chosen. Although substantial grading could ease the transition, the grade change could complicate the establishment of comfortable pedestrian and bicycle paths over the lid. Visual connectivity could also be reduced, depending on the height of the lid. A lid of this length would also require very large ventilation shafts, which could disrupt community connectivity due to their imposing presence.

Aesthetics

The extended lids in this concept would have benefits similar to those in Concept 2. However, extension of these lids would require walls that would rise well above the grade of adjacent residential neighborhoods, public open spaces, and natural areas. These walls would cast shadows, block local and scenic views, and contrast with the scale and character of their surroundings. As with Concept 2, a substantial vent structure would also be required.

Noise

Under Concept 3, the lids would be extended to cover SR 520 through most of the Montlake Neighborhoods. Under this option, only a limited number of residual noise impacts would be projected and overall noise levels would be reduced at most residential areas.

The limited noise impacts would likely occur near the access ramps and at the endpoints of the lid. Noise mitigation that may be recommended to reduce or eliminate the reaming impacts could include noise walls along the access ramps. In addition, noise walls may also be recommended near the endpoints of the lid to prevent noise from flanking back to the neighborhoods. Noise impacts from ventilation fans would be mitigated with noise reducing louvers or fan silencers.

Option 3 would result in the lowest noise levels and least amount of residual noise impacts when compared to Concept 1 or 2, and therefore require the least amount of noise mitigation.

Air Quality

Impacts would be similar to those described for Concept 3 in the Eastlake/Portage Bay area.

Cost

The cost associated with Concept 3 is roughly estimated at $340 million (M). Tables detailing the cost assumptions can be found in Appendix B.

5.2.3 Lake Washington To West of I-405

5.2.3.1 Concept 1 - Expanded Bridges

Neighborhood Connectivity

This concept would result in limited improvements to neighborhood connectivity. Each of the expanded bridges would provide areas suitable for additional landscaping as well as improved non-motorized connections such as bicycle and pedestrian paths. Although no new paths would be created, the pedestrian environment and setting could be improved with landscaping which could encourage non-motorized travel between these neighborhoods. Concept 1b would be wider, and would therefore provide more opportunities for non-motorized improvements. Landscaping on each of the bridges could be thematically tied to Three Points School, Fairweather Park, Hunts Point Park, or to residential areas on either side of the bridge, which could visually connect the neighborhoods. Vehicular travel routes would be neither enhanced nor detrimentally altered. Widened bridges in these neighborhoods would not have the capacity for the provision of neighborhood amenities or civic facilities.

Aesthetics

Evergreen Point Road Area (Concept 1)

The broad bridge proposed in this concept would provide an attractive visual connection between the neighborhoods on each side of SR 520. It would hide views of SR 520, while providing a striking scenic view west across Lake Washington. The width of the bridge would accommodate substantial plantings, creating a vegetative corridor between the Medina and Clyde Hill on the south side of SR 520, and Hunts Point to the north.

84th Avenue NE Area

Concept 1a: Similar to the bridge in Concept 1, this bridge would create a pleasant landscaped corridor between the neighborhoods that flank SR 520. The ends of this bridge would abut residential properties, potentially causing the removal of a dense vegetative buffer that currently provides a privacy screen for several homes. This screen could be replaced, either by replanting, or by erecting other visual barriers such as walls or fences.

Concept 1b: The bridge in this concept would have benefits and impacts similar to those in Concept 1a. The additional width of this bridge also would provide a relatively large open space that would have some of the characteristics of a small park.

92nd Avenue NE Area

Concept 1a: The bridge proposed in this concept would provide an attractive visual connection between the neighborhoods on each side of SR 520, and would hide views of SR 520. The width of the bridge would accommodate substantial plantings, creating a vegetative corridor between the Clyde Hill on the south side of SR 520, and Yarrow Point to the north.

Concept 1b: The additional width of the bridge in this concept would cause the removal of dense vegetative buffers that flank SR 520, and provide privacy for homeowners at the top of the SR 520 cut. These buffers could be replaced, either by replanting, or by erecting walls or fences.

Noise Barriers

All of these concepts would entail utilization of noise barriers. Because barriers in this area would mostly be located in cut profiles, they would mostly be below the sight line of adjacent land uses and would therefor impose relatively minor impacts. It may be possible to convert these barriers to retaining walls, and fitting behind the wall to create usable open space. The retained area could then be planted with trees and shrubs that would screen highway views, and provide landscaping within the highway corridor.

In several cases, these barriers would be located at grade in residential neighborhoods. These barriers, in addition to reducing noise levels, may also screen undesirable highway views. However they may also block views, cast shadows, and contrast with the surrounding visual character. Visual impacts from barriers may be reduced by carefully designing them to match the scale and feel of the neighborhoods in which they are placed. Plantings along barriers would help them blend into their surroundings, and use of appropriate materials would allow barriers to match the architectural styles of nearby buildings.

Noise

The expanded bridges under Concepts 1a or 1b are not projected to reduce noise impacts in this segment of the project corridor.

Noise mitigation measures, which would be the same with standard bridges, would include placing noise walls along both sides of SR 520 from the Lake Washington high-rise structure to I-405 with limited breaks in the walls at locations where no noise mitigation would be required. With the project noise mitigation, most, if not all, noise impacts could be mitigated and a substantial noise level reduction could be achieved throughout this section of the project corridor. Residual impacts may occur near the bridges and access ramps, or at locations where topography makes noise mitigation ineffective or not cost effective.

No significant residual noise impacts are projected under Concept 1a or 1b with the noise mitigation.

Air Quality

This concept would have no impact on the quantity of gaseous air emissions released from vehicle exhaust, including carbon monoxide (CO), oxides of nitrogen (NO_x), volatile organic compounds (VOC) and sulfur dioxide (SO_2).

Cost

The cost associated with Concepts described above is as follows:

- Concept 1 for the Evergreen Point Road - $10 M
- Concept 1a and 1b for 84th Avenue NE - $15 M, $35 M, respectively.
- Concept 1a and 1b for 92nd Avenue NE - $20 M, $40 M., respectively.

5.2.3.2 Concept 2 – Lids In Topographic Areas that Support Lidding

Neighborhood Connectivity

A lid at Evergreen Point Road would connect Fairweather Park with Three Points School to the south of SR 520. This connection would be stronger in Concept 2b than in Concept 2a because of the larger area that Concept 2b would provide. However, Concept 2b would require a larger amount of grading to bring the existing ground elevation even with the lid, especially at the portal areas. Without such grading, the Concept 2b lid, and to a lesser extent, the Concept 2a lid, would have the appearance of a protruding box. This "box effect" could preclude the creation of trails and will limit visual connectivity. Both lid concepts could include substantial amounts of landscaping and open space, which could encourage non-motorized travel across the freeway. Additional street enhancements along 76th Avenue/Evergreen Point Road could help visually reconnect southern and northern Medina from the street level. Both lids would have minor potential for the incorporation of civic facilities. The presence of a ventilation shaft could be physically intrusive depending on its location.

A lid at 84th Avenue NE would provide a moderate amount of community connectivity since approximately 600 feet of the lid will blend in well with the surrounding terrain. A moderate amount of grading would need to occur in order to smooth the transition from the existing elevation to the top of the proposed lid. However, the lid would still be low enough relative to the existing land elevation that views from either side would not be substantially hampered. Concept 2b would be long enough to connect areas south of SR 520 with Hunts Point Park. Vehicular patterns would be unaffected. The easterly end of the lid would need to be "stepped", so active recreational space and civic buildings could not be included in that area. The central portion of the lid could accommodate these type of improvements. The presence of a ventilation shaft could be physically intrusive depending on its location.

A lid at 92nd Avenue would help reconnect the town of Yarrow Point. Either lid option would have the potential to fit well into the SR 520 corridor if the highway is regraded. The creation of a lid here would present the opportunity for community enhancement features to be developed

between the residential areas on both sides of SR 520. Although vehicular travel patterns would remain the same here, bicycle and pedestrian environments at these points could be enhanced, although the east-bound on ramp and west-bound off ramp could complicate connections. The additional space created by the lid options would offer increased opportunities for landscape treatments. As with the other lids, this lid would have some potential for the incorporation of smaller civic buildings. The presence of a ventilation shaft could be physically intrusive depending on its location.

Aesthetics

Evergreen Point Road Area, 84th Avenue NE Area, and 92nd Avenue NE Area

Concept 2a: The lids in Concept 2a for each of these areas would be beneficial in several ways: They would partially block views of SR 520; they would tie together the visual character of neighborhoods on opposite sides of the highway; and they would provide attractive open space with plantings, community gathering places, and public amenities.

In some cases, lid-related structures, amenities, and activities might contrast with existing visual resources. Public activities related to lid open spaces would be adjacent to residential neighborhoods, and may require visual screening like walls, fences or planting. The length of these lids would necessitate vent structures. These structures would rise well above the lid surface, obstructing views and contrasting with existing and proposed visual resources.

Concept 2b: The lids in Concept 2b for these areas would add to the beneficial open space of these areas, however walls would need to be constructed to extend the lids into areas with steep cross slopes. These walls would rise above the surrounding grade, casting shadows, blocking views, and contrasting with the scale and overall character of surrounding neighborhoods.

Noise

Under Concept 2 the lidded sections of the highway would be effective at reducing noise levels and impacts in residential areas located inside the lidded segments. For many receivers located near the endpoints of the lid, noise levels may be higher than without the lidded section. The level of residual noise impacts would be less under Concepts 2b than under Concepts 2a, and therefore require less noise mitigation.

Noise mitigation for the remaining impacts would consist of noise walls which would essentially "fill the gaps" between the lidded sections on the three bridges, and continue east toward I-405. As with Concept 1, there may be some breaks in the walls in areas where no noise mitigation is required. Any added noise related to ventilation fans could be mitigated with noise reducing louvers or fan silencers.

Future noise levels for areas within in the lidded section of the highway would be lower than under Concept 1. Residential locations outside the lidded areas with noise walls for mitigation would also experience lower noise levels, however, most likely not to the same extent as in the lidded sections. No significant residual noise impacts are projected under Concept 2 with the

noise mitigation.

Air Quality

Impacts will be similar to those described for Concept 2 in the Eastlake/Portage Bay area.

Cost

The cost associated with each of the Concepts described above is as follows:

- Concept 2a and 2b for the Evergreen Point Road - $190 M, $350 M, respectively.
- Concept 2a and 2b for 84th Avenue NE - $370 M, $510 M, respectively.
- Concept 2a and 2b for 92nd Avenue NE - $160 M, $320 M, respectively.

Tables detailing the cost assumptions can be found in Appendix B.

5.2.3.3 Concept 3 - Community Suggestions

Neighborhood Connectivity

A continuous lid from Evergreen Point Road to east of 92nd Avenue would offer the greatest amount of space for neighborhood connectivity for the West of I-405 area. This lid would reconnect land spanning four different jurisdictions and would all but eliminate the physically-intrusive presence of SR 520 in these communities. The sheer size of the lid would allow for a wide variety of design concepts – bike trails, civic buildings, and open space could all feasibly exist. However, substantial portions of this lid would protrude above ground, restricting areas where connectivity amenities could be implemented. Also, the lid's effectiveness would be hindered by the presence of two long ventilation shafts.

Aesthetics

The extensive lid in this concept would expand the list of amenities detailed in the description of Concept 2. The increased area would dramatically add to the creation of open space, providing opportunities for unstructured recreation, or for much-needed athletic fields. The continuous open space would provide opportunities for an uninterrupted non-motorized transportation route from the east shore of Lake Washington to Bellevue Way NE. This lid could accommodate broad swaths of planting for both screening and ornamental purposes. It would also screen substantial areas of SR 520, while reducing the extent of noise barriers and their impacts.

Because many areas along the SR 520 corridor have steep cut and fill slopes, it would not be possible to fit the lid into the surrounding landscape along its entire length. In significant portions of the lid high walls would need to be constructed, retaining slopes on the uphill side of the lid, and elevating the lid over the downhill side. In places, these walls would tower over their surroundings, dwarfing adjacent houses, casting shadows and contrasting with residential neighborhoods, public open space, and natural areas. Additionally, the extensive length of lid would require several substantial vent structures. These would rise well above the lid surface,

obstructing views and contrasting with existing and proposed visual resources.Air Quality

Impacts will be similar to those described for Concept 3 in the Eastlake/Portage Bay area. Due to the long length of the proposed lid and the larger area collecting vehicular emissions, it is likely that localized concentrations near the lidded openings and ventilation structures would be higher than concentrations under Concept 2, although this is highly dependent on both traffic and meteorological conditions at any given time. No quantitative estimate for the impact to concentrations can be made at this time.

Noise

Under Concept 3 the proposed lid would run continuously from east of Evergreen Point Road to Bellevue Way. For residential areas within this segment of the highway, noise impacts are unlikely.

Minimal residual noise impacts could occur near the access ramps and near the eastern high-rise structure along Lake Washington. Noise mitigation for the access ramps could include noise wall that would be blended in with the lids, and the ventilation fans could be mitigated with special louvers or fan silencers.

Noise levels along this segment of the SR-520 corridor would most likely be the lowest under Concept 3. Minimal residual noise impacts could occur near the access ramps and near the eastern high-rise structure along Lake Washington.

Air Quality

Impacts will be similar to those described for Concept 3 in the Eastlake/Portage Bay area. Due to the long length of the proposed lid and the larger area collecting vehicular emissions, it is likely that localized concentrations near the lidded openings and ventilation structures would be higher than concentrations under Concept 2, although this is highly dependent on both traffic and meteorological conditions at any given time. No quantitative estimate for the impact to concentrations can be made at this time.

Cost

The cost associated with Concept 3 is roughly estimated at $2.2 billion. Tables detailing the cost assumptions can be found in Appendix B.

5.2.4 East of I-405 to SR 202

5.2.4.1 Concept 1 - Expanded Bridges

No expanded bridges are proposed in this area.

5.2.4.2 Concept 2 – Lids In Topographic Areas that Support Lidding

No lids are proposed under this concept.

5.2.4.3 Concept 3 - Community Suggestions

Neighborhood Connectivity

Proposed lids in Option 3 would be located at NE 31st Street and NE 40th Street. To a limited extent, these two lids could reduce the effects of SR 520 as a barrier between the neighborhoods in close proximity to these lids. These two lids could feature pedestrian enhancements and landscaping and could improve or encourage non-motorized travel between neighborhoods on either side of SR 520 through the creation of bike/pedestrian paths. By aesthetically improving this overpass with landscaping, nearby communities could feel visually connected. However, benefits would be isolated to the areas near NE 40th Street; the majority of the corridor has no lids proposed. Areas targeted by the community for improvement – aesthetic treatments to 148th Avenue and trail connections near the Sammamish River – would not be aided by these treatments.

Aesthetics

NE 40th Street & NE 31st Street Area

The proposed lid in this concept would link commercial and office development that flank SR 520 in this area. The lid could support a variety of attractive spaces such as courtyards, plazas, walkways, and small gardens in an area that currently features few public landscapes. A small area of vegetative buffer would be removed as part of this proposed development, however the open space on this lid would provide extensive opportunities for replanting. Additionally, the lid would create a pedestrian/bicycle corridor across SR 520, away from crowded arterial roads that serve this area.

Noise

Because many of the areas that would benefit from the lids are commercial, or industrial, warrants for noise mitigation may not be met. As with the other lids, there is the potential for increased noise at the lid endpoints, and noise mitigation may be required in some areas of this segment of the corridor.

Air Quality

Impacts will be similar to those described for Concept 2 in the Eastlake/Portage Bay area, although no ventilation is required for the two proposed lidded sections.

Cost

The cost associated with Concept 3 is roughly estimated at $110 M for 40th Street and $60 M for 31st Street. Tables detailing the cost assumptions can be found in Appendix B.

5.3 SUMMARY OF POTENTIAL NOISE IMPACTS OF EACH CONCEPT

Table 5-1 summarizes the potential noise impacts of each of the concept examined. Information in the table includes:

1. Noise Impacts without Lids or Noise Mitigation: This concept, though not explored in the text, assumes the project is constructed with no lids or noise mitigation.

2. Noise Impacts with Mitigation and without Lids: This concept assumes construction of the project with normal noise mitigation measures and no additional lids.

3. Noise Impacts with Lids, and without the Noise Mitigation: This concept assumes only the application of the lids with no additional noise mitigation, and provides a rating of the lids overall effectiveness at noise reduction

4. Noise Impacts with Lids and Noise Mitigation: This concept assumes the lids and the noise mitigation.

At this time, none of the options can guarantee that all residential areas in the project corridor will have noise levels below the WSDOT 66 dBA traffic noise impact criteria. It may be that during the analysis, it is possible to eliminate all projected noise impacts, however, residual noise from main arterial roads and SR 520 access ramps may not allow for all receivers in the corridor to have noise levels under the criteria levels. During the environmental noise impact analysis, every effort will be made to reduce noise levels and eliminate impacts throughout the project corridor; however, all design concepts do have some potential for residual noise impacts.

Table 5-1. Noise Impact Comparison Summary

See definitions above for details on the options presented in this table	1. Noise Impacts w/o Mitigation	2. Noise Impacts w/mitigation & w/o lids	3. Noise Impacts w/Lids & w/o Supplemental Mitigation	4. Noise Impacts w/Lids & Supplemental Mitigation
Eastlake/Portage Bay/Roanoke/North Capitol Hill Neighborhoods				
Concept 1			○	◐
Concept 2			○	◐
Concept 3	○	◐	◐	◐
Montlake Neighborhoods				
Concept 1			○	◐
Concept 2			○	◐
Concept 3	○	◐	◐	◐
Lake Washington to West of I-405				
Concept 1a				
Concept 1b			○	◐
Concept 2a			○	◐
Concept 2b			◐	◐
Concept 3	○	◐	◐	◐
East of I-405 to SR 202				
Concept 1			*N/A*	*N/A*
Concept 2			*N/A*	*N/A*
Concept 3	○	◐	◐	◐

○ = High Level of Noise Impacts (equal to, or worse than current conditions, significant impacts)

◐ = Medium Level of Noise Impacts (lower noise than current conditions, some reduction in noise impacts)

◐ = Low Level of Noise Impacts (lower noise than current, with potential for residual impacts)

◐ = Lowest Level of Noise Impacts (much lower noise than current, with minimal potential for residual impacts)

● = No Noise Impacts (much lower noise than current with no residual impacts)

5.4 RECOMMENDATIONS

A recommendation regarding lidding concepts will be prepared following the All Committee Workshop on May 23, 2001.

6. REFERENCES

To be provided with final document.

APPENDIX A

Photos Depicting Lidding Concepts

Appendix A - Photos Depicting Lidding Concepts

Figure A-1: Example of widened bridge (Northeast view of East Mercer Way, Mercer Island, WA)

Figure A-2: Example of widened bridge (North view of East Mercer Way, Mercer Island, WA)

Figure A-3: Example of Protruding Lid Section (North side or Luther Burbank Lid, Mercer Island, WA)

Figure A-4: Example of Protruding Lid (North side or Luther Burbank Lid, Mercer Island, WA)

Figure A-5: Pedestrian Access where lid protrudes from surrounding terrain (Luther Burbank Lid, Mercer Island Washington)

Figure A-6: Top view of the Luther Burbank Lid, which provides connectivity between Mercer Island Business District and the Luther Burbank Park

Figure A-7: Protruding Lid with stair-stepped section - First Hill Lid, Mercer Island, Washington

Figure A-8: Alternate view of protruding lid with stair-stepped section (First Hill Lid, Mercer Island, Washington

Figure A-9: Ventilation Shafts, First Hill Lid, Mercer Island, Washington

Figure A-10: Ventilation Building, First Hill Lid, Mercer Island, Washington

Figure A-11: Ventilation Shafts, Seattle Lid, Seattle Washington

Figure A-12: Lid Structure approach – Seattle Lid, Seattle, Washington

Figure A-13: Ventilation Stacks with recreational amenities, Seattle Lid, Seattle, Washington

Figure A-14: Fill Material Placed Against Lid walls (as opposed to leaving protruding wall sections)

APPENDIX B

Cost of Lidding

Eastlake/Portage Bay/Roanoke/North Capital Hill Neighborhood

	Description	Cost
Concept 1	Expanded Bridges at Delmar, 10th and Roanoke	$ 60,000,000
Concept 2	Topographic Areas which support lidding	$ 320,000,000
Concept 3	Community Suggestions	$ 470,000,000

Montlake Neighborhoods

	Description	Cost
Concept 1	Expanded Bridge at Montlake Blvd	$ 25,000,000
Concept 2	Topographic Areas which support lidding	$ 90,000,000
Concept 3	Community Suggestions	$ 320,000,000

West of I-405 to Lake Washington

Concept 1	Description	Cost
Concept 1	Expanded 100' Bridge at Evergreen Point Road	$ 10,000,000
Concept 1A	Expanded 100' Bridge at 84th Ave NE	$ 15,000,000
Concept 1B	Expanded 250' Bridge at 84th Ave NE	$ 35,000,000
Concept 1A	Expanded 100' Bridge at 92nd Ave NE	$ 20,000,000
Concept 1B	Expanded 300' Bridge at 92nd Ave NE	$ 40,000,000

West of I-405 to Lake Washington

Concept 2	Description	Cost
Concept 2A	850' lid at Evergreen Point Road	$ 190,000,000
Concept 2B	1500' lid at Evergreen Point Road	$ 350,000,000
Concept 2A	1300' lid at 84th Ave NE	$ 310,000,000
Concept 2B	1800' lid at 84th Ave NE	$ 430,000,000
Concept 2A	615' lid at 92nd Ave NE	$ 300,000,000
Concept 2B	1180' lid at 92nd Ave NE	$ 560,000,000

West of I-405 to Lake Washington

Concept 3	Description	Cost
Concept 3	Community Suggestions-Full length from Lake Washington to Bellevue Way	$ 2,680,000,000

East of I-405 to SR 202

	Description	Cost
Concept 1	No expanded bridges have been proposed	$ -
Concept 2	No areas have been identified that support lids	$ -
Concept 3	800' lid at 40th Street	$ 110,000,000
Concept 3	400' lid at 31st Street	$ 60,000,000

Concept 1: Eastlake/Portage Bay/Roanoke/North Capital Hill Nieghborhood

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
I-5 Lid Structures	Roanoke St. Bridge	Expaned Bridge Decking with Landscaping	45,000	SF	$ 145	$ 6,525,000	
	10th Ave Bridge	Expaned Bridge Decking with Landscaping	60,000	SF	$ 145	$ 8,700,000	
	Delmar Dr E Bridge	Expaned Bridge Decking with Landscaping	45,000	SF	$ 145	$ 6,525,000	
			Subtotal			$ 21,750,000	A
Notes:		Traffic Control on "A"	15%			$ 3,262,500	B
		Construction Staging on "A"	10%			$ 2,175,000	C
		Removals on "A"	5%			$ 1,087,500	D
			Subtotal			$ 28,275,000	E
		Mobilization on "E"	8%			$ 2,262,000	F
		Construction Contingency on "E"	15%			$ 4,241,250	G
		Construction Cost	Subtotal			$ 34,778,250	H
		Sales Tax on "H"	8.8%			$ 3,060,486	I
		Preliminary Engineering on "H"	15%			$ 5,216,738	J
		Construction Administration on "H"	15%			$ 5,216,738	K
			Subtotal			$ 48,272,211	L
		Additional Scope Contingency on "M"	20%			$ 9,654,442	M
			Total			$ 57,926,653	N
			Total (Rounded)			**$ 60,000,000**	

Concept 1: Montlake Neighborhoods

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
Montlake Lid Structure	Montlake Blvd NE	Expaned Bridge Decking with Landscaping	60,000	SF	$ 145	$ 8,700,000	
			Subtotal			$ 8,700,000	A
Notes:		Traffic Control on "A"	15%			$ 1,305,000	B
		Construction Staging on "A"	10%			$ 870,000	C
		Removals on "A"	5%			$ 435,000	D
			Subtotal			$ 11,310,000	E
		Mobilization on "E"	8%			$ 904,800	F
		Construction Contingency on "E"	15%			$ 1,696,500	G
		Construction Cost	Subtotal			$ 13,911,300	H
		Sales Tax on "H"	8.8%			$ 1,224,194	I
		Preliminary Engineering on "H"	15%			$ 2,086,695	J
		Construction Administration on "H"	15%			$ 2,086,695	K
			Subtotal			$ 19,308,884	L
		Additional Scope Contingency on "M"	20%			$ 3,861,777	M
			Total			$ 23,170,661	N
			Total (Rounded)			**$ 25,000,000**	

Concept 1: Evergreen Point Road

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
Evergreen Point Lid Structure	Evergreen Point Road	Expaned Bridge Decking with Landscaping	25,000	SF	$ 145	$ 3,625,000	
			Subtotal			$ 3,625,000	A
Notes:		Traffic Control on "A"	15%			$ 543,750	B
1. Profile adjustment for this section covered in road realignment to new floating bridge.		Construction Staging on "A"	10%			$ 362,500	C
		Removals on "A"	5%			$ 181,250	D
			Subtotal			$ 4,712,500	E
		Mobilization on "E"	8%			$ 377,000	F
		Construction Contingency on "E"	15%			$ 706,875	G
		Construction Cost	Subtotal			$ 5,796,375	H
		Sales Tax on "H"	8.8%			$ 510,081	I
		Preliminary Engineering on "H"	15%			$ 869,456	J
		Construction Administration on "H"	15%			$ 869,456	K
			Subtotal			$ 8,045,369	L
		Additional Scope Contingency on "M"	20%			$ 1,609,074	M
			Total			$ 9,654,442	N
			Total (Rounded)			**$ 10,000,000**	N

Concept 1A: 84th Ave NE

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
84th Street Lid Structure	84th Ave NE	Expaned Bridge Decking with Landscaping	30,000	SF	$ 145	$ 4,350,000	
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	42,222	CY	$ 20	$ 844,444	
Roadway	Surfacing and Paving	Surface Paving	7,600	LF	$ 75	$ 570,000	
	Signs and striping	Signing/Striping	7,600	LF	$ 15	$ 114,000	
			Subtotal			$ 5,878,444	A
Notes:		Traffic Control on "A"	15%			$ 881,767	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	10%			$ 587,844	C
		Removals on "A"	5%			$ 293,922	D
			Subtotal			$ 7,641,978	E
		Mobilization on "E"	8%			$ 611,358	F
		Construction Contingency on "E"	15%			$ 1,146,297	G
		Construction Cost	Subtotal			$ 9,399,633	H
		Sales Tax on "H"	8.8%			$ 827,168	I
		Preliminary Engineering on "H"	15%			$ 1,409,945	J
		Construction Administration on "H"	15%			$ 1,409,945	K
			Subtotal			$ 13,046,690	L
		Additional Scope Contingency on "M"	20%			$ 2,609,338	M
			Total			$ 15,656,028	N
			Total (Rounded)			**$ 15,000,000**	N

Concept 1B: 84th Ave NE

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
84th Street Lid Structure	84th Ave NE	Expaned Bridge Decking with Landscaping	75,000	SF	$ 145	$ 10,875,000	
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	42,222	CY	$ 20	$ 844,444	
Roadway	Surfacing and Paving	Surface Paving	7,600	LF	$ 75	$ 570,000	
	Signs and striping	Signing/Striping	7,600	LF	$ 15	$ 114,000	
			Subtotal			$ 12,403,444	A
Notes:		Traffic Control on "A"	15%			$ 1,860,517	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	10%			$ 1,240,344	C
		Removals on "A"	5%			$ 620,172	D
			Subtotal			$ 16,124,478	E
		Mobilization on "E"	8%			$ 1,289,958	F
		Construction Contingency on "E"	15%			$ 2,418,672	G
		Construction Cost	Subtotal			$ 19,833,108	H
		Sales Tax on "H"	8.8%			$ 1,745,313	I
		Preliminary Engineering on "H"	15%			$ 2,974,966	J
		Construction Administration on "H"	15%			$ 2,974,966	K
			Subtotal			$ 27,528,353	L
		Additional Scope Contingency on "M"	20%			$ 5,505,671	M
			Total			$ 33,034,024	N
			Total (Rounded)			**$ 35,000,000**	N

Concept 1A: 92nd Ave NE

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
92nd Street Lid Structure	92nd Ave NE	Expaned Bridge Decking with Landscaping	25,000	SF	$ 145	$ 3,625,000	
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	113,778	CY	$ 20	$ 2,275,556	
Roadway	Surfacing and Paving	Surface Paving	12,800	LF	$ 75	$ 960,000	
	Signs and striping	Signing/Striping	12,800	LF	$ 15	$ 192,000	
			Subtotal			$ 7,052,556	A
Notes:		Traffic Control on "A"	15%			$ 1,057,883	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	10%			$ 705,256	C
		Removals on "A"	5%			$ 352,628	D
			Subtotal			$ 9,168,322	E
		Mobilization on "E"	8%			$ 733,466	F
		Construction Contingency on "E"	15%			$ 1,375,248	G
		Construction Cost	Subtotal			$ 11,277,036	H
		Sales Tax on "H"	8.8%			$ 992,379	I
		Preliminary Engineering on "H"	15%			$ 1,691,555	J
		Construction Administration on "H"	15%			$ 1,691,555	K
			Subtotal			$ 15,652,526	L
		Additional Scope Contingency on "M"	20%			$ 3,130,505	M
			Total			$ 18,783,032	N
			Total (Rounded)			**$ 20,000,000**	N

Concept 1B: 92nd Ave NE

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
92nd Street Lid Structure	92nd Ave NE	Expaned Bridge Decking with Landscaping	75,000	SF	$ 145	$ 10,875,000	
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	151,111	CY	$ 20	$ 3,022,222	
Roadway	Surfacing and Paving	Surface Paving	13,600	LF	$ 75	$ 1,020,000	
	Signs and striping	Signing/Striping	13,600	LF	$ 15	$ 204,000	
			Subtotal			$ 15,121,222	A
Notes:		Traffic Control on "A"	15%			$ 2,268,183	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	10%			$ 1,512,122	C
		Removals on "A"	5%			$ 756,061	D
			Subtotal			$ 19,657,589	E
		Mobilization on "E"	8%			$ 1,572,607	F
		Construction Contingency on "E"	15%			$ 2,948,638	G
		Construction Cost	Subtotal			$ 24,178,834	H
		Sales Tax on "H"	8.8%			$ 2,127,737	I
		Preliminary Engineering on "H"	15%			$ 3,626,825	J
		Construction Administration on "H"	15%			$ 3,626,825	K
			Subtotal			$ 33,560,222	L
		Additional Scope Contingency on "M"	20%			$ 6,712,044	M
			Total			$ 40,272,266	N
			Total (Rounded)			**$ 40,000,000**	N

Concept 2: Eastlake/Portage Bay/Roanoke/North Capital Hill Nieghborhood

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
I-5 Lid Structures	I-5 Roanoke St Vincinity	Lid with Ventilation	120,000	SF	$ 345	$ 41,400,000	
	10th Ave E to Delmar Dr E	Lid with Ventilation	130,500	SF	$ 345	$ 45,022,500	
	I-5 to 10th Ave E	Lid with Ventilation	81,250	SF	$ 345	$ 28,031,250	
			Subtotal			$ 114,453,750	A
Notes:		Traffic Control on "A"	15%			$ 17,168,063	B
1. Lid Structure Width varies with average width of about 190 feet.		Construction Staging on "A"	15%			$ 17,168,063	C
2. Lid over SR 520 at I-5 IC is assume to be built with enough open wall portions and spacings to provide adequate ventilation.		Removals on "A"	5%			$ 5,722,688	D
			Subtotal			$ 154,512,563	E
3. Flammable materials will be prohibited along the SR 520 corridor.		Mobilization on "E"	8%			$ 12,361,005	F
		Construction Contingency on "E"	15%			$ 23,176,884	G
		Construction Cost	Subtotal			$ 190,050,452	H
		Sales Tax on "H"	8.8%			$ 16,724,440	I
		Preliminary Engineering on "H"	15%			$ 28,507,568	J
		Construction Administration on "H"	15%			$ 28,507,568	K
			Subtotal			$ 263,790,027	L
		Additional Scope Contingency on "M"	20%			$ 52,758,005	M
			Total			$ 316,548,033	N
			Total (Rounded)			**$ 320,000,000**	

Concept 2: Montlake Neighborhood

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
Montlake Lid Structure	Montlake Blvd NE	Lid with Ventilation	101,250	SF	$ 345	$ 34,931,250	
			Subtotal			$ 34,931,250	A
Notes:		Traffic Control on "A"	10%			$ 3,493,125	B
1. Lid Structure Width averages 200 feet		Construction Staging on "A"	10%			$ 3,493,125	C
2. Lids 800 feet and less in length don't require ventilation or fire		Removals on "A"	5%			$ 1,746,563	D
3. Flammable materials will be prohibited along the SR 520 corridor.			Subtotal			$ 43,664,063	E
		Mobilization on "E"	8%			$ 3,493,125	F
		Construction Contingency on "E"	15%			$ 6,549,609	G
		Construction Cost	Subtotal			$ 53,706,797	H
		Sales Tax on "H"	8.8%			$ 4,726,198	I
		Preliminary Engineering on "H"	15%			$ 8,056,020	J
		Construction Administration on "H"	15%			$ 8,056,020	K
			Subtotal			$ 74,545,034	L
		Additional Scope Contingency on "M"	20%			$ 14,909,007	M
			Total			$ 89,454,041	N
			Total (Rounded)			**$ 90,000,000**	N

Concept 2A: Evergreen Point Road

Location	Description	Type	Quantity	Unit	Unit Cost	Cost
Evergreen Point Lid Structure	Evergreen Point Road	Lid with Ventilation	212,500	SF	$ 345	$ 73,312,500
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	97,778	CY	$ 20	$ 1,955,556

Roadway	Surfacing and Paving	Surface Paving	4,400	LF	$ 75	$ 330,000	
	Signs and striping	Signing/Striping	4,400	LF	$ 15	$ 66,000	
			Subtotal			$ 75,664,056	A
Notes:		Traffic Control on "A"	10%			$ 7,566,406	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	10%			$ 7,566,406	C
		Removals on "A"	5%			$ 3,783,203	D
			Subtotal			$ 94,580,069	E
		Mobilization on "E"	8%			$ 7,566,406	F
		Construction Contingency on "E"	15%			$ 14,187,010	G
		Construction Cost	Subtotal			$ 116,333,485	H
		Sales Tax on "H"	8.8%			$ 10,237,347	I
		Preliminary Engineering on "H"	15%			$ 17,450,023	J
		Construction Administration on "H"	15%			$ 17,450,023	K
			Subtotal			$ 161,470,878	L
		Additional Scope Contingency on "M"	20%			$ 32,294,176	M
			Total			$ 193,765,053	N
			Total (Rounded)			**$ 190,000,000**	N

Concept 2B: Evergreen Point Road

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
Evergreen Point Lid Structure	Evergreen Point Road	Lid with Ventilation	375,000	SF	$ 345	$ 129,375,000	
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	97,778	CY	$ 20	$ 1,955,556	
Roadway	Surfacing and Paving	Surface Paving	4,400	LF	$ 75	$ 330,000	
	Signs and striping	Signing/Striping	4,400	LF	$ 15	$ 66,000	
			Subtotal			$ 131,726,556	A
Notes:		Traffic Control on "A"	10%			$ 13,172,656	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	15%			$ 19,758,983	C
		Removals on "A"	5%			$ 6,586,328	D
			Subtotal			$ 171,244,522	E
		Mobilization on "E"	8%			$ 13,699,562	F
		Construction Contingency on "E"	15%			$ 25,686,678	G
		Construction Cost	Subtotal			$ 210,630,762	H
		Sales Tax on "H"	8.8%			$ 18,535,507	I
		Preliminary Engineering on "H"	15%			$ 31,594,614	J
		Construction Administration on "H"	15%			$ 31,594,614	K
			Subtotal			$ 292,355,498	L
		Additional Scope Contingency on "M"	20%			$ 58,471,100	M
			Total			$ 350,826,598	N
			Total (Rounded)			**$ 350,000,000**	N

Concept 2A: 84th Ave NE

Location	Description	Type	Quantity	Unit	Unit Cost	Cost
84th Street Lid Structure	84th Ave NE	Lid with Ventilation	325,000	SF	$ 345	$ 112,125,000
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	42,222	CY	$ 20	$ 844,444

Roadway	Surfacing and Paving	Surface Paving	7,600	LF	$ 75	$ 570,000	
	Signs and striping	Signing/Striping	7,600	LF	$ 15	$ 114,000	
Retaining Walls	Stair stepped walls on along lid	Retaining walls	24,480	SF	$ 60	$ 1,468,800	
			Subtotal			$ 115,122,244	A
Notes:		Traffic Control on "A"	10%			$ 11,512,224	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	15%			$ 17,268,337	C
		Removals on "A"	5%			$ 5,756,112	D
			Subtotal			$ 149,658,918	E
		Mobilization on "E"	8%			$ 11,972,713	F
		Construction Contingency on "E"	15%			$ 22,448,838	G
		Construction Cost	Subtotal			$ 184,080,469	H
		Sales Tax on "H"	8.8%			$ 16,199,081	I
		Preliminary Engineering on "H"	15%			$ 27,612,070	J
		Construction Administration on "H"	15%			$ 27,612,070	K
			Subtotal			$ 255,503,691	L
		Additional Scope Contingency on "M"	20%			$ 51,100,738	M
			Total			$ 306,604,429	N
			Total (Rounded)			**$ 310,000,000**	N

Concept 2B: 84th Ave NE

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
84th Street Lid Structure	84th Ave NE	Lid with Ventilation	450,000	SF	$ 345	$ 155,250,000	
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	144,444	CY	$ 20	$ 2,888,889	
Roadway	Surfacing and Paving	Surface Paving	10,400	LF	$ 75	$ 780,000	
	Signs and striping	Signing/Striping	10,400	LF	$ 15	$ 156,000	
Retaining Walls	Stair stepped walls on along lid	Retaining walls	25,920	SF	$ 60	$ 1,555,200	
			Subtotal			$ 160,630,089	A
Notes:		Traffic Control on "A"	10%			$ 16,063,009	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	15%			$ 24,094,513	C
		Removals on "A"	5%			$ 8,031,504	D
			Subtotal			$ 208,819,116	E
		Mobilization on "E"	8%			$ 16,705,529	F
		Construction Contingency on "E"	15%			$ 31,322,867	G
		Construction Cost	Subtotal			$ 256,847,512	H
		Sales Tax on "H"	8.8%			$ 22,602,581	I
		Preliminary Engineering on "H"	15%			$ 38,527,127	J
		Construction Administration on "H"	15%			$ 38,527,127	K
			Subtotal			$ 356,504,347	L
		Additional Scope Contingency on "M"	20%			$ 71,300,869	M
			Total			$ 427,805,216	N
			Total (Rounded)			**$ 430,000,000**	N

Concept 2A: 92nd Ave NE

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
92nd Street Lid Structure	92nd Ave NE	Lid with Ventilation	307,500	SF	$ 345	$ 106,087,500	
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	191,111	CY	$ 20	$ 3,822,222	
Roadway	Surfacing and Paving	Surface Paving	17,200	LF	$ 75	$ 1,290,000	
	Signs and striping	Signing/Striping	17,200	LF	$ 15	$ 258,000	
			Subtotal			$ 111,457,722	A
Notes:		Traffic Control on "A"	10%			$ 11,145,772	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	15%			$ 16,718,658	C
		Removals on "A"	5%			$ 5,572,886	D
			Subtotal			$ 144,895,039	E
		Mobilization on "E"	8%			$ 11,591,603	F
		Construction Contingency on "E"	15%			$ 21,734,256	G
		Construction Cost	Subtotal			$ 178,220,898	H
		Sales Tax on "H"	8.8%			$ 15,683,439	I
		Preliminary Engineering on "H"	15%			$ 26,733,135	J
		Construction Administration on "H"	15%			$ 26,733,135	K
			Subtotal			$ 247,370,606	L
		Additional Scope Contingency on "M"	20%			$ 49,474,121	M
			Total			$ 296,844,727	N
			Total (Rounded)			**$ 300,000,000**	N

Concept 2B: 92nd Ave NE

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
92nd Street Lid Structure	92nd Ave NE	Lid with Ventilation	587,500	SF	$ 345	$ 202,687,500	
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	305,778	CY	$ 20	$ 6,115,556	
Roadway	Surfacing and Paving	Surface Paving	17,200	LF	$ 75	$ 1,290,000	
	Signs and striping	Signing/Striping	17,200	LF	$ 15	$ 258,000	
			Subtotal			$ 210,351,056	A
Notes:		Traffic Control on "A"	10%			$ 21,035,106	B
1. Includes additional earthwork cost to change profile and to repave the existing lanes to the new profile. New lane paving cost are not included since they would be incurred whether the profile was changed for lids or not.		Construction Staging on "A"	15%			$ 31,552,658	C
		Removals on "A"	5%			$ 10,517,553	D
			Subtotal			$ 273,456,372	E
		Mobilization on "E"	8%			$ 21,876,510	F
		Construction Contingency on "E"	15%			$ 41,018,456	G
		Construction Cost	Subtotal			$ 336,351,338	H
		Sales Tax on "H"	8.8%			$ 29,598,918	I
		Preliminary Engineering on "H"	15%			$ 50,452,701	J
		Construction Administration on "H"	15%			$ 50,452,701	K
			Subtotal			$ 466,855,657	L
		Additional Scope Contingency on "M"	20%			$ 93,371,131	M
			Total			$ 560,226,788	N
			Total (Rounded)			**$ 560,000,000**	N

Concept 3: I-5 Lid Structures

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
I-5 Lid Structures	I-5 Roanoke St Vincinity	Lid with Ventilation	280,000	SF	$ 345	$ 96,600,000	
	10th Ave E to Delmar Dr E	Lid with Ventilation	130,500	SF	$ 345	$ 45,022,500	
	I-5 to 10th Ave E	Lid with Ventilation	81,250	SF	$ 345	$ 28,031,250	
			Subtotal			$ 169,653,750	A
Notes:		Traffic Control on "A"	15%			$ 25,448,063	B
		Construction Staging on "A"	15%			$ 25,448,063	C
		Removals on "A"	5%			$ 8,482,688	D
			Subtotal			$ 229,032,563	E
		Mobilization on "E"	8%			$ 18,322,605	F
		Construction Contingency on "E"	15%			$ 34,354,884	G
		Construction Cost	Subtotal			$ 281,710,052	H
		Sales Tax on "H"	8.8%			$ 24,790,485	I
		Preliminary Engineering on "H"	15%			$ 42,256,508	J
		Construction Administration on "H"	15%			$ 42,256,508	K
			Subtotal			$ 391,013,552	L
		Additional Scope Contingency on "M"	20%			$ 78,202,710	M
			Total			$ 469,216,262	N
			Total (Rounded)			**$ 470,000,000**	N

Concept 3: Montlake Neighborhood

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
Montlake Lid Structure	Montlake Blvd NE	Lid with Ventilation	365,625	SF	$ 345	$ 126,140,625	
			Subtotal			$ 126,140,625	A
Notes:		Traffic Control on "A"	10%			$ 12,614,063	B
		Construction Staging on "A"	10%			$ 12,614,063	C
		Removals on "A"	5%			$ 6,307,031	D
			Subtotal			$ 157,675,781	E
		Mobilization on "E"	8%			$ 12,614,063	F
		Construction Contingency on "E"	15%			$ 23,651,367	G
		Construction Cost	Subtotal			$ 193,941,211	H
		Sales Tax on "H"	8.8%			$ 17,066,827	I
		Preliminary Engineering on "H"	15%			$ 29,091,182	J
		Construction Administration on "H"	15%			$ 29,091,182	K
			Subtotal			$ 269,190,401	L

		Additional Scope Contingency on "M"	20%			$	53,838,080	M
			Total			$	323,028,481	N
			Total (Rounded)			**$**	**320,000,000**	N

Concept 3: All Lids Identified by the Community

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
Eastside Community Lid Structure	Lid from Lake Washington to 96th	Lid w/ Ventilation	2,450,000	SF	$ 345	$ 845,250,000	
Cut and Fill Quantities	Adjust grades for lid	Cut and Fill	4,582,400	CY	$ 20	$ 91,648,000	
Roadway	Surfacing and Paving	Surface Paving	37,200	LF	$ 75	$ 2,790,000	
	Signs and striping	Signing/Striping	37,200	LF	$ 15	$ 558,000	
	Impact attenuators for off ramps	Impact attentuators	2	EA	$ 25,000	$ 50,000	
Retaining Walls	Bench earth on side along raise portion of lid	Retaining walls	483,000	SF	$ 60	$ 28,980,000	
			Subtotal			$ 969,276,000	A
Notes:		Traffic Control on "A"	15%			$ 145,391,400	B
1. Lid Structure Width=10+35+10+4x12+10+10+10+4x12+10+35+12=236		Construction Staging on "A"	15%			$ 145,391,400	C
Ten foot wide shoulder, 4 twelve foot lanes, and seventy feet		Removals on "A"	5%			$ 48,463,800	D
of ventilation and thirty feet of structure.			Subtotal			$ 1,308,522,600	E
2. Includes additional earthwork cost to change profile and to repave the							
existing lanes to the new profile. New lane paving cost are not included since		Mobilization on "E"	8%			$ 104,681,808	F
they would be incurred whether the profile was changed for lids or not.		Construction Contingency on "E"	15%			$ 196,278,390	G
3. Cost also include additional retaining walls to terrace sides of lid into		Construction Cost	Subtotal			$ 1,609,482,798	H
the existing topography of the surrounding community.							
		Sales Tax on "H"	8.8%			$ 141,634,486	I
		Preliminary Engineering on "H"	15%			$ 241,422,420	J
		Construction Administration on "H"	15%			$ 241,422,420	K
			Subtotal			$ 2,233,962,124	L
		Additional Scope Contingency on "M"	20%			$ 446,792,425	M
			Total			$ 2,680,754,548	N
			Total (Rounded)			**$ 2,680,000,000**	N

Concept 3: 40th Street Lid Structure

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
40th Street Lid Structure	Lid at 40th Street, 800'	Lid w/ Ventilation	129,600	SF	$ 345	$ 44,712,000	
			Subtotal			$ 44,712,000	A
Notes:		Traffic Control on "A"	10%			$ 4,471,200	B
1. Lid cost does not include any additional cost to place a structure on top		Construction Staging on "A"	10%			$ 4,471,200	C

of the lid structure.	Removals on "A"	5%	$	2,235,600	D
	Subtotal		$	55,890,000	E
	Mobilization on "E"	8%	$	4,471,200	F
	Construction Contingency on "E"	15%	$	8,383,500	G
	Construction Cost	Subtotal	$	68,744,700	H
	Sales Tax on "H"	8.8%	$	6,049,534	I
	Preliminary Engineering on "H"	15%	$	10,311,705	J
	Construction Administration on "H"	15%	$	10,311,705	K
		Subtotal	$	95,417,644	L
	Additional Scope Contingency on "M"	20%	$	19,083,529	M
		Total	$	114,501,172	N
		Total (Rounded)	**$**	**110,000,000**	N

Concept 3: 31st Street Lid Structure

Location	Description	Type	Quantity	Unit	Unit Cost	Cost	
31st Street Lid Structure	Lid at 31st Street, 400'	Lid w/ Ventilation	64,800	SF	$ 345	$ 22,356,000	
		Subtotal				$ 22,356,000	A
Notes:		Traffic Control on "A"	10%			$ 2,235,600	B
1. Lid cost does not include any additional cost to place a structure on top		Construction Staging on "A"	10%			$ 2,235,600	C
of the lid structure.		Removals on "A"	5%			$ 1,117,800	D
		Subtotal				$ 27,945,000	E
		Mobilization on "E"	8%			$ 2,235,600	F
		Construction Contingency on "E"	15%			$ 4,191,750	G
		Construction Cost	Subtotal			$ 34,372,350	H
		Sales Tax on "H"	8.8%			$ 3,024,767	I
		Preliminary Engineering on "H"	15%			$ 5,155,853	J
		Construction Administration on "H"	15%			$ 5,155,853	K
		Subtotal				$ 47,708,822	L
		Additional Scope Contingency on "M"	20%			$ 9,541,764	M
		Total				$ 57,250,586	N
		Total (Rounded)				**$ 60,000,000**	N